A NEW PARTNERSHIP FOR ENERGY AND ENVIRONMENT

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Environmental management increasingly is being accepted by corporations as a sound business strategy that can give a company a competitive edge.

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ENVIRONMENTAL MANAGEMENT SYSTEMS

Business and industry, over the last decade, have recognized the value of "quality management systems"in improving the quality, and the market acceptance, of their products. The success of "QM" systems has led industry to explore ways of extending the concepts embodied in such systems to other management areas. In parallel, industry has recognized that the increasing number and types of environmental requirements faced by virtually every industrial facility can no longer be satisfied by the "traditional" approaches. As a result, an increasing number of companies and individual industrial facilities are developing and implementing an "Environmental Management Systems" (EMS) as means of meeting their environmental requirements in a more systematic and effective way. An EMS recognizes the common needs of both internal and external stakeholders and develops a proactive management system that meets the expectations of all the stakeholders. A representative EMS includes:

- management commitment, responsibility and oversight;
- planning and control at all levels of management;
- documentation of procedures and records;
- audit and inspection procedures;
- processes for corrective action and continual improvement; and
- continual and ongoing training and capability building.

The Wilton Armetale Foundry of Mt Joy, PA, is a good example of what is happening within many industrial companies.[2] Wilton Armetale recognized that maintaining compliance with the many environmental requirements was going to become increasingly more difficult, that some of the barriers between the regulators and industry needed to be broken, and the "bad industry" label that foundries had received needed to be changed. Wilton began by developing goals to:

- ensure that Wilton Armetale could adopt a worry-free attitude concerning environmental issues
- partner with the state and federal regulators to secure a two-way working relationship
- communicate their plan and goals to the community, thus breaking the industry -community barrier

With those goals in mind, Wilton developed and implemented a strategic environmental plan that encompassed the different aspects: pollution prevention, waste source reduction, recycling and community awareness. The program that was developed has resulted both in substantial energy, environmental and production cost savings while meeting the three goals established for the program.

Wilton Armetale is only one of many companies who have derived multiple benefits from the development of an environmental management system tailored to the needs and requirements of their individual operations. Those companies that have developed a successful EMS recognize that for it to be successful, it must be integrated into the total management structure of the company/organization. An EMS must become an integral part of the corporate planning program, incorporated into the daily operational process, included in the employee training program, integrated into the data gathering and analysis process and meshed into the management decision process. In summary, the organization makes a conscious commitment to continual improvement in the organization's environmental impact and that commitment becomes a part of the formal and informal culture of the organization.

THE INTERNATIONAL STANDARD FOR ENVIRONMENTAL MANAGEMENT SYSTEMS

In June 1992, at the U.N. Conference on Environmental Development, the International Standards Organization made a commitment to analyze environmental management practices. Subsequently, ISO formed an ISO Technical Committee (TC 207) to develop standards in the field of environmental management tools and systems. Subsequently, those standards were identified as **ISO 14000.** Participants from about 120 countries, primarily from the private sector, were involved in the process. In the U.S., the American National Standards Institute (ANSI), the official U.S. representative to the ISO, formed a "TC207 TAG" (Technical Advisory Group) to review the draft standards and develop position papers for the U.S. delegation.

ISO 14000 is contained in a series of documents. ISO 14001 - *System Specification for an Environmental Management System*, is the basic framework for the Standard and contains the requirements that a firm must satisfy to become "ISO14000 certified."[3] All of the other documents in the series are management guidance tools. Those documents are:

- ISO 14004 -	Guidelines for use with ISO 14001
- ISO 14010 - 14012	Guidelines for Environmental Auditing
- ISO 14020 - 14024	Guidelines for Environmental Labeling
- ISO 14031 -	Guidelines for Environmental Performance Evaluation
- ISO 14040 - 14043	Guidelines for Environmental Management
- ISO 14050 -	Terms and Definitions
- ISO 14060 -	Guide for the Inclusion of Environmental Aspects in Product Standards

The ISO 14000 series provides a structure for integrating an EMS into an organization and it can be used by firms of all sizes and types anywhere in the world. It can be implemented within the whole organization, for all processes at one site, or just for a specific process. It is a structure for developing an environmental management *system*.

ISO 14001, 14004 and 14010-14012 have all been published as final standards. Auditors have been trained and a number of companies have been certified as meeting the specifications contained in 14001. The other guidance documents are in various stages of preparation. Publication dates are projected to range from late 1997 for several of the labeling standards, several of the life cycle assessment documents and the Terms and Definitions document to 1999 for the other documents in the series.[4]

A company can develop and implement an EMS outside the framework of ISO 14000 and some companies have done so. However, most companies have developed their EMS within the ISO 14000 framework even if they have elected not to incur the expense and workload of being "certified." Discussions with a number of company representatives that have developed an EMS following the 14000 framework have stated that although it is not considered to be cost effective to become certified at this time, their companies have developed their systems such that they could be certified if that proves to be advantageous in the future. However, as of April 1997, 14 U.S. facilities, plus two facilities in Canada and one in Mexico have been certified to the international standard. It is believed by most observers that the number of certified facilities will be rather small for a year or so, but as these "early adopters" report their experiences and both the accrediting organizations and industrial facilities become more familiar with the requirements of the standard, the number of companies seeking certification will rapidly increase.

EMS BENEFITS

The development and implementation of an EMS can provide many benefits to a company including:

- providing a single management system to control data and track corporate environmental regulations
- providing a marketing advantage with customers, investors and the community
- assisting in the marketing of "green" products worldwide
- improving the ability to obtain insurance coverage for pollution induced damages
- reducing environmental liability and risk
- bettering the firms image in environmental performance and regulatory compliance
- achieving cost saving in pollution prevention and energy resources.

In summary, a well developed and smoothly operating EMS can be a vital instrument for increasing corporate

accountability both internally and externally. In addition, some companies who have a major commitment to international trade have an additional impetus for implementing an ISO 14001 EMS. The European Commission has approved ISO 14001 as a means of demonstrating partial compliance with Europe's Eco-Management and Audit Scheme (EMAS).[4] Compliance with EMAS is vital to doing business in most European countries. Thus, U.S. companies wishing to be competitive in those countries can utilize and be accredited under the international standard and be assured that their EMS will be acceptable in the EMAS regulated markets.

EMS AND INDUSTRIAL ENERGY EFFICIENCY

EMS commits management to take an integrated approach to achieving continuous improvement in the company/facility environmental management program. An "integrated" approach means all pollution media are targeted, all employees are included in the process and all functions in the industrial process from planning to shipment are continuously analyzed for possible improvement. In such a system, nearly all energy efficiency improvements, such as systematic maintenance, the installation of new energy efficient and pollution prevention technology in the industrial processes and the use of automated control systems for continuous monitoring and control of operating systems will become an integral part of an EMS. Significant resource savings will accrue from those energy efficiency improvements.

The value of an integrated approach to managing the operations of industrial facilities has been illustrated in several different studies.

An integrated approach to looking at a company's production process has been dramatically illustrated by the Industrial Assessment Program (IAP) sponsored by the Department of Energy Office of Industrial Technologies. For many years, the program conducted energy audits for small industrial facilities. Several years ago, the program expanded its audit capability and permitted the participating Centers to perform combined energy and waste management assessments (the term waste management assessment was selected to sharply delineate the assessments from "environmental audits"!). When only energy audits were being conducted, approximately 36% of the recommended improvements were implemented with an average energy cost savings of $15,000 per year. However, under the industrial assessment program the implementation rate for those recommendations considered to be energy related have risen to 46% and the annual average energy cost savings have risen to $16,300. Further, 39% of the recommended waste management recommendations have been implemented with average annual cost savings of an additional $22,400.[5] Thus, the implemented cost savings are averaging nearly $49,000 per year. The Industrial Assessment Program has proven that there is a high degree of correlation between energy and environmental management in industrial facilities. Analyzing the two in an integrated way has resulted in substantial savings in each of the individual processes and in total for the industrial facility.

Wilton Armetale Foundry as a result of the analysis performed under their EMS program decided to modify their metal melting practices. At the completion of those process modifications, waste was reduced by 45% and electric energy use was reduced by 33%. Plans are now underway to purchase high efficiency melting equipment which will reduce electricity use by another 40%. Continuing analysis also indicated that part of the waste product might be usable by another industrial facility. Negotiations have now been completed with that facility which will result in further 20% reduction in waste going to a landfill. Wilton also discovered that water recycling, which was initiated as a pollution prevention measure, has resulted in savings in the energy used in the finishing process. Data is now being gathered to quantify those savings. Further, Wilton determined, through the analysis conducted under the EMS program, that other energy savings, particularly electrical energy saving could be achieved in both the foundry and office buildings. Various energy efficiency improvements have been made or are planned in conjunction with other projects.[6]

Boyd, McClelland, et al, (1996) report that in their study of integrated paper plants (ie, plants where on-site raw material is converted to a final product) environmental compliance and productivity/capacity expansion are far ahead of energy efficiency in competition for investment funds. However, those plants that were considered to be "best practice" paper plants (ie, those plants where there was a systematic approach to determining operational requirements and a commitment to continuous improvement) have obtained a distinct production advantage over non best practice plants in that the best practice plants had a 12% lower fossil-fuel intensity and used 80% less purchased electricity than non best practice plants.[7]

The symbiosis between improved industrial energy efficiency and industrial pollution prevention is becoming more evident as companies and industrial facilities turn their attention from merely conforming to environmental regulations to the development of a management system that moves beyond mere compliance and seeks to continually improve resource management, production efficiency and environmental emissions. Not only is this systematic management approach being taken by individual companies but whole industrial sectors are beginning to take a more holistic approach. For example, the DOE Office of Industrial Technologies is facilitating the development of "Industries of the Future" with each of the major energy consuming industrial sectors. The "industry visions" vary from industry to industry, but a review of their vision statements reveals that they understand the importance of looking at the total industrial process. The *glass industry* vision contains the following goals: reduce production costs 20% below 1995 levels: reduce process energy use by 50%; and reduce air/water emissions by 20%. The *metal casting* industry vision cites among their objectives: develop advanced manufacturing technologies to increase productivity 15%, reduce lead times 50%, reduce energy consumption by 3-5%; and develop environmental technologies that will achieve 100% pre and post consumer recycling. The *steel* industry vision, in identifying major challenges and barriers, states that: "the pressure to improve environmental performance will remain a competitive challenge . . . ; the industry will remain energy and resource intensive and vulnerable to volatile energy prices . . . ; pressure to reduce solid waste, maximize resources and increase recycling must be factored in . . . " The *forest products* industry recognizes the interrelationships in the pulp and paper production process by stating that of the six areas most critical to the industry, four of them (energy performance, environmental performance, recycling and sensors and controls) are part of the industrial process. In order to meet the needs of those critical areas, they established as two of their five primary goals: "to be capable of meeting demanding environmental requirements without the predicted increases in capital expenditures, operating costs, and energy consumption. And "to continue the significant progress in building energy self-sufficiency . . . " Similarly, the *aluminum* industry stated that to meet the goals established for the industry, the industry will need to maintain scientific and engineering leadership in the six areas of: energy efficiency, manufacturing processes and technologies, ecological sustainability, enabling technologies, information technologies and computational materials. All of those areas are integral parts of the manufacturing process and all related one to another.

Each industry, in a slightly different way, has recognized the interrelationships among and between resources, production, and environmental management. Their key strategies call for an integrated approach to achieving their long range vision.[8]

The foregoing examples illustrate that many industrial sites, companies, and whole industrial sectors are actively involved in improving their total efficiency. And as a part of that process, industrial energy efficiency and environmental issues are being evaluated in a more comprehensive and complementary manner. But, more can be done. Industrial energy efficiency professionals should be aware of, and promote, many and diverse approaches to increasing plant efficiencies and reducing emissions.

POTENTIAL PROGRAM LINKAGES

One of the initiatives which offers an opportunity for synergism is the EPA-sponsored Brownfields Redevelopment program. "Brownfields" are idle, or underutilized industrial and commercial sites where expansion or redevelopment is complicated by real or perceived environmental contamination. There are approximately 425,000 such sites in the U.S. The EPA Brownfields program is directed toward revitalizing those contaminated properties and to bring life and economic vitality back to the site or community. There are many facets to, and many arguments concerning, the Brownfields program but one of the prime concerns is that the businesses planning to develop the Brownfields sites do not add to the site contamination. The development and use of an EMS by the new occupant/operator would provide assurance that the site would achieve a level of environmental performance beyond "mere compliance" with minimum regulatory requirements and reduce their environmental risk exposure. Equally important, the EMS process of continual analysis, planning, feedback and improvement would ensure that other efficiencies in areas such as resource management, energy use and process operations are achieved. Properly administered, a Brownfields redevelopment program with an ISO 14000 type EMS component, would fulfill many of the objectives set out for the program.[9]

Another program that shares many of the concepts and basic premises of an industrial EMS program is the Eco-Industrial Park (EIP) concept. In both programs, the site is looked upon as an integrated and holistic facility. "The design of the EIP will emphasize waste minimization, conservation of energy, and maximum use of the most environmentally friendly materials in the construction and operation of the facilities. Internal engineering and operational standards will demonstrate best environmental practice in energy use, solid waste reduction and water management. Resource and energy use will be mapped."[10] Although slightly different terminology is used, it is clear that the process and the end result of an industrial facility EMS and the establishment of an EIP have the same goal. That is, to develop and implement a program where best management practices are exercised, personnel at all levels are involved and there is a commitment to continuous improvement in all operations of the facility.

M.E. Porter and C.L. van der Linde have also recognized the interrelationship between energy and the environment, but they have taken a slightly different approach. Instead of leaving it up to industry to work within the framework of present environmental regulations, they argue that well designed regulations can lead industry to develop innovative approaches that result in both productivity improvements and emission that meet or exceed the environmental requirements.[11] Similarly, if regulators provide those companies or facilities that have well developed and smoothly running EMS programs some flexibility in determining how emission standards are met, then the result will likely be increased energy and production efficiencies as well as reduced emissions

Researchers can also benefit from the widespread utilization of an EMS. It is well recognized that new technologies are developed as a direct result of operational identification of a function that could be performed in a better way. It is suggested that under the continuing analysis and improvement regime required under an EMS, there will be an increased demand for new and improved technologies. The result could be both a better system of feedback to the researcher that a new technology or process is needed and an improved communication channel for the researcher to present the results of the research efforts.

CONCLUSION

As demonstrated throughout this paper, the old axiom that the whole is greater than the sum of its parts can be equally applied to relationship between energy efficiency and environmental management. It has been demonstrated in different programs, different industries and different facilities that when an industrial facility is viewed as integrated system, the interrelationships of the various components of the system can be readily identified making it much easier to justify cost-effective improvements that provide benefits to several or more elements of the system. Boyd, McClellan, et al, in their study of integrated paper and steel mills draw the conclusion that "To the extent environmental and energy policies focus more broadly on increasing production efficiency and achieving more 'win - win' solutions, then the capital constraints associated with pollution abatement and capital rationing may be less important."[12] A more broadly stated corollary could be postulated as follows: Environmental and energy policies should focus on encouraging, promoting and supporting the analyses, actions, and total commitment called for in the development, implementation and aggressive maintenance of an *environmental management system*. The result would be a "win - win" situation that would have multiple benefits: decreased production (including energy) cost, decreased emissions, an increase in competitiveness, and a more positive image with both customers and the community.

In that scenario, the tensions between the advocates of the various disciplines and technologies would no longer need to justify their needs in competition with the others. Rather, both energy efficiency experts and environmental supporters can work together to facilitate more synergistic environmental and energy efficiency policies and procedures that would provide benefits and rewards to both.

End Notes:

1. Dr. Margaret Kerr, Senior Vice President for Human Resources and the Environment, Northern Telecom, Ltd., Ontario, Canada; honoree paper for the U.N. Environment Programme, "Eyes on the Environment - 25 Women Leaders in Action."

2. International Environmental Systems Update, March 1997, "Greening of Wilton Armetale", Dave Schell, Environmental Specialist, Wilton Armetale.

3. ISO 14000 and ISO 14001 are often used interchangeably which creates some confusion. Since ISO 14001 is the system specification and the document that contains the requirements that must be met for certification, it is noted that references to the international standard are increasingly being stated as ISO 14001. It is believed that eventually ISO 14001will become the general reference term for the international standard.

4. International Environmental Systems Update, April 1997, ISO 14000 Document Status, page 19.

4. Environmental Management Report, Volume 2, Number 4/5, McGraw-Hill Company, April/May. 1997

5. Data provided to the authors by the Office of Industrial Productivity and Energy Assessment, Rutgers State University of New Jersey. The Office of Industrial Productivity manages the data base for the Industrial Assessment Program.

6. Letter dated April 21, 1997 from David Schell, Wilton Armetale, to the authors.

7. Technical Report, "The Interrelationship Between Environmental Goals, Productivity Improvement, and Increased Energy Efficiency in Integrated Paper and Steel Plants," Cooperative Research Study by Argonne National Laboratory and Pacific Northwest Laboratory for the U.S. Department of Energy , October 1996.

8. Office of Industrial Technologies, "Enhancing the Competitiveness, Efficiency, and Environmental quality of American Industry Through Technology Partnership, 1997.

9. D.J. Freeman and G.R. Belcamino, Brownfields redevelopment and ISO 14000: A Marriage That Makes Sense, The Business Coalition For Sustainable Cities white paper, 1996

10. Cornell's Perspective on Eco-Industrial Parks, Cornell Work and Environment Initiative, http:\\www.cfe.cornell.edu\wei\cupersp.html

11. Porter, M.E. and C.L. van de Linde, "Green and Competitive: Ending the Stalemate, Harvard Business Review, Sept-Oct 1995.

12. Technical Report, "The Interrelationship Between Environmental Goals, Productivity Improvement, and Increased Energy Efficiency in Integrated Paper and Steel Plants,"