

AC 1997-249: ISO 14000 Standards-Environmental Management for the 21st Century

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ISO 9000 series is the international standard for a quality control system that guarantees a least performance level for products and guidelines to achieve ISO certification. These have been in place for several years and have become widespread in the manufacturing, service, and product development businesses. ISO 14000 standards are patterned from the 9000 series, are expected to be issued within the next year, will encompass environmental management standards under three organizational elements and three additional product-oriented elements. The organizational elements to be included are: Environmental Management Systems, Environmental Auditing, and Environmental Performance. The three product-related elements will be: Life Cycle Analysis, Environmental Labeling; and Environmental Aspects of Product Standards. The basis for all of the international standards developed by ISO is the idea of quality management (QM). Successful application of any of the existing standards in the upcoming ISO 14000 series requires a firm understanding by the engineering and technical professions what these standards require.

Taken to their ultimate conclusion, all ISO standards themselves provide the guidelines to achieving ISO certification, which in turn, characterizes the organization by the very standards it set to achieve by that certification. This paper will review the important aspects and the underlying philosophy of these standards, presenting the 9000 series as background for the new 14000 standards. It will also outline the infrastructure of the certification process in the United States and the benefits of certification. Finally, where and how the information about the standards and their underlying philosophy might be incorporated into engineering education, will be addressed.

BACKGROUND

ISO is the International Organization for Standardization whose objective is to promote the development of standards, testing, and certification to encourage the trade of goods and services. Besides setting specific standards for all types of products, this international organization produces management principles. Organizationally, it consists of representatives of ninety-one countries, each of which is represented by some national standards organization. The American National Standards Institutes (ANSI), for example, is the U.S. representative to ISO. ANSI is the standards organization that facilitates the development of consensus standards in the U.S. ANSI itself does not develop or write standards. It provides a structure and mechanism for industry or product groups to come together to establish consensus and develop a standard.

The international organization has more than 180 technical committees that cover many industry sectors and products. The American Society of Quality Control (ASQC) administers the U.S. Technical Advisory Group (TAG), which presents its views to the international ISO technical committee.

INTELLECTUAL BASIS OF ISO STANDARDS

The ISO 14000 series of standards or principles is being designed to help industry better track their own environmental operations, compliance, and performance. Many companies with existing environmental management systems are evaluating their own plans and comparing them with the draft ISO proposals for the various aspects of environmental management. The first two components of this environmental management series will be released this year: ISO 14001 and ISO 14010, the Environmental Management Systems Protocol and the Environmental Audits Systems, respectively. Other environmental management issues that will become themes of an ISO environmental standard include: product labeling (ISO 14020 series), environmental performance evaluation (ISO 14030 series), and product life cycle assessments (ISO 14040 series).

The Environmental Management Systems (EMS) Standard (ISO 14001) is the most general and will also provide the guidelines for the entire series. The overseeing committees for comment and compilation have already released several draft documents. Although consensus for most of this proposed standard exists, controversy still exists especially in reporting results to the home government regulatory agencies.

The Environmental Auditing Standard (ISO 14010) will focus on determining if organizations have implemented their environmental management system, EMS, meeting their local regulations as well as their own internal expectations. These audits may be conducted either by the company itself or by an outsider. External auditors are perceived to be more objective by judgmental onlookers and regulators, and they are currently the more favored option. Several drafts of the ISO 14010 standard are currently being circulated for comment. In their existing form, the Environmental Auditing Standard is presented as a series of recommendations and guidelines.

The Environmental Labeling Standards (ISO 14020) currently being developed cover three types of labels, ranging from specific to general. The first type of product label will deal with the environmental friendliness of the product. A second type of label will confirm a company's environmental claim, such as recyclability. The third type of label will deal with the environmental consequences of the product or service. Fairness and consistency should be of ultimate emphasis and importance in all product labeling. A draft of the ISO 14020 standards will be circulated for comment sometime after January 1997.

The Environmental Performance Evaluation Standards (ISO 14030) specifies the relative success anticipated in an environmental management plan. One integral component of this standard will be an anticipated schedule of performance improvements. Environmental Performance Evaluation (EPE) is an ongoing process. This is in sharp contrast to the snapshot view that results from an environmental audit. Again, the idea of continual environmental improvements is reinforced. The success of meeting the specified performance improvements is measured against criteria or goals established by the organization. These goals and criteria are environmental performance indicators, EPI's, which are established by the organization in its EMS.

The Life-Cycle Analysis Standards (ISO 14040) are currently the least defined standards. The processes involved in a life-cycle analysis of a given product are very complicated and include many different qualitative and quantitative steps. Once the processes are delineated, the impacts of each process must be defined. Following identification and definition development, they must be analyzed appropriately. Lastly, the process identifies alternatives for improvement or lessening of the defined impacts. Again, evaluation of an improved environment is a prime objective.

Ultimately, an ISO Environmental Management System should reflect a commitment from top management to meet the appropriate laws and regulations and for continual evolution of the management system. To meet these commitments, an organization must integrate the making and implementation of continuous improvements into the global objectives of the organization. Primarily, the environmental management system should provide a means for an organization to reach its target goals through the structures, internal management, controls and documented accountability procedures. The mechanics for achieving these goals should involve a variety of measuring and monitoring strategies to document progress toward the established goals.

IMPLEMENTATION STRATEGY

ISO 14000 certification may be approached in seven phases. Phase One should include the development of an education plan for the company that explains how the elements of the standards apply. Additionally, a core team should be formed that includes representatives from all key areas of the company. This team should be chaired by an ISO 14000 management representative or his/her designated person. This person should be responsible for identifying necessary activities for successful registration, a schedule for the required activities, and maintaining open communication between management and employees. Important issues that must be kept in open dialog are those that concern the progress of activities, potential roadblocks, and action plans necessary to achieve compliance.

Phase Two is the organization of the developing environmental management system. The objective is to organize all current and needed documents, procedures, and information so that the company has a single, accessible and identifiable source of reference when audited. Important items to include are company quality and quality control policy, quality manual, organization-wide procedures for dealing with environmentally sensitive materials, regulatory compliance documents, and company safety and emergency procedures, especially those that may affect the environment. Also important and necessary are the business management documents including the company mission statement, organizational chart, responsibilities, key processes and procedures, quality plans, operation controls, and training plans for every department

The remaining phases will follow from these first two important steps. Phase Three is the Internal Audit System Implementation. Phase Four is the process of selecting a registrar to perform the actual ISO inspection or audit. Phase Five will be the official audit. Phase Six will be the removal of non-conformities; and Phase Seven, the final ISO 14000 Registration. Depending on the status of an organization's environmental management system, and its size and diversity, the registration process may take up to two years from the time when the decision is made to attempt ISO certification.

WHO SHOULD CONSIDER ISO CERTIFICATION?

Overall, the benefits of ISO registration can be categorized in three areas: market advantages; performance/compliance improvements; and economic advantages, such as cost savings. Market advantages have already emerged for ISO 9000, the Quality Management Standards, certified organizations. It is becoming a standard for doing business, particularly in the international market such that pressure from the financial community and the public to become registered develops. Establishment and implementation of environmental management and compliance standards along with their documentation provide a mechanism for improving performance and compliance. Lastly, economic advantages are become real as cost savings result from more integrated management, continuous monitoring and feedback, and overall better management and control of production, services, and housekeeping. Having a better understanding of the status of the organization and its activities puts a company in a good position to make sound business decisions, decrease reporting times, and ensure that jobs get done correctly, on time, and within budget. These advantages are enhanced due to an improved image of the organization and increased community goodwill.

ISO 14000 registration should be considered by any company who is responsible for or cares about environmental management; is concerned with certifications; or sells a product or provides a service that may relate to an environmental issue at some time. Some ISO 14000 standards will be applicable to most every type of organization. The size of the organization should not be an issue with respect to ISO 14000 registration. Both large and small organizations either have, or will someday have some interactions with or impacts on the environment that will have to be addressed. Large organizations, i.e., large chemical companies, power utilities; and those that already carry ISO 9000 certifications for quality management will probably be among the first to become ISO 14000 certified.

To help in the decision making process of whether or not to become certified, a company may want to ask itself some or all of the following diagnostic questions. What is your company's competition doing? What do your customers want? Will ISO 14000 registration improve efficiency, effectiveness, or the economy of the organization? Will coordination, cooperation, or communication be improved? Are internal customers and/or stakeholders involved with the ISO implementation? Serious answers to these questions should help define the desirability of ISO Standards implementation for any organization.

ISO 14000 STANDARDS and ENVIRONMENTAL ENGINEERING EDUCATION

The question that environmental engineering educators must address is what impact will the implementation of the ISO 14000 standards have, if any, on environmental engineering education. Obviously, as these standards are adopted by businesses and organizations in the next decade, the average business vision will evolve to incorporate the ISO 14000 philosophies. The business environment that all engineering students will move into upon graduation will be infiltrated with ISO environmental quality management ideals. To prepare students better for this evolving work environment, it is important that educators become familiar with the ISO standards and incorporate their underlying quality philosophy into the curriculum. There are several places where this could easily be done in environmental engineering curricula. Two such suggestions will be presented.

Many introductory environmental engineering courses include a unit on environmental management issue. Recently, these units have begun to include an introduction to the ideas of Sustainable Development, in the framework of a variety of case studies. Sustainable Development is an integral part of the foundation of the ISO 14000 environmental management standards, and can easily be included as a mechanism for an organization to approach and ultimately achieve this ideal. It must be understood and emphasized the nature of all ISO standards dictates that every certified organization have a unique environmental management system, suited to their own activities, goals, and mission statement. The underlying philosophy for all is the same and they are all developed from the same guidelines.

The second easily visualized place in the curriculum where the ISO 14000 standards may be taught and perhaps, even implemented is in a senior design course. It is in these courses that senior environmental engineering students are expected to solve an open-ended design problem including all the externalities, i.e., social, ethical, economic, and political issues. Obtaining local and state permits, doing Environmental Impact Assessments, and general project management can all be used as examples of environmental management. Additionally, the evaluation of alternatives of a project, is also an intrinsic activity of the ISO 14000 standards.

CONCLUSIONS

The ISO 9000 Standards for Quality Management are fast becoming the norm for global organizations dealing with products and services. It is very likely that the ISO 14000 Standards for Environmental Management will follow the same trend, perhaps at an accelerated pace, for even a broader spectrum of companies. These international standards for quality management of products and services and the environment offer detailed guidelines for implementing quality management in all aspects of any organization. They define the processes necessary to insure quality, without specifying exactly what processes should be implemented. Despite the initial costs in resources, time, and money, there are many significant long-term rewards for adoption of any of these standards appropriate to a given organization. In light of the growing importance of ISO 14000 in the world business community, it is vital that we incorporate the context and philosophy of the standards in to environmental engineering education.

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