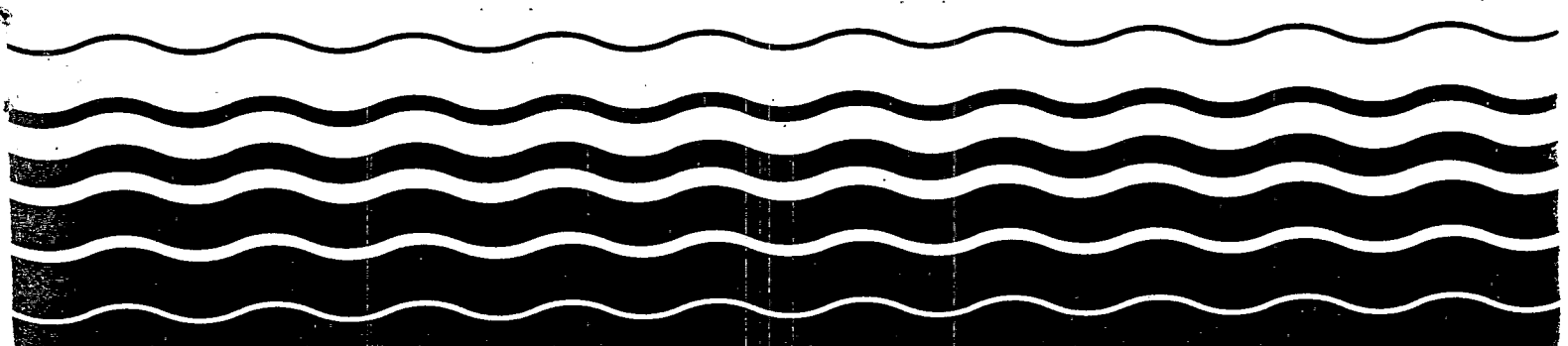




Environmental Management System Demonstration Project

Final Report



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December 1996

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CONTENTS

I. Foreword	1
Organization of the Report	1
Advice to Readers	2
Acknowledgments	2
II. Executive Summary	3
Project Overview	3
Project Findings	4
Conclusions	8
III. Introduction and Project Overview	9
Project Summary	9
Project Activities in Detail	12
Profile of Participating Organizations	13
IV. EMS Implementation Progress	16
Background on EMS Assessments and Data Analysis	16
Self-Assessment Results	17
Findings from Independent Assessments	21
V. Findings on Key EMS Implementation Issues	25
Incentives for Implementing an EMS	25
Benefits and Costs of Implementation	27
Barriers and Keys to Successful Implementation	31
Links with ISO 9000 and Health & Safety	33
Comparison of SMEs and Large Organizations	34
Recommended Guidance and Implementation Tools	36
Participant Feedback on ISO 14001	38
Participant Advice to Regulators	42
VI. Conclusions	43
Major Lessons Learned	43
Remaining Questions and Areas for Future Study	44
VII. Case Studies	46
3M Corporation	47
Allergan, Inc.	51
Commodore Applied Technologies	54
Fluke Corporation	56
Globe Metallurgical Inc.	59
Hach Company	62

K.J. Quinn & Co.	67
Lockheed Martin Federal Systems	70
Madison Gas and Electric Company	73
Milan Screw Products	76
NEO Industries Ltd.	80
NIBCO Incorporated	83
Pacific Gas and Electric Company	86
Pitney Bowes Inc.	89
TRINOVA Corporation	92
United States Postal Service	95
Washtenaw County Government	98

VIII. Bibliography	101
---------------------------------	------------

IX. Appendices	102
Appendix A: Background on ISO 14000, EMS Standards, and Registration	102
Appendix B: Questions Asked of Participants at Conclusion of Project	107
Appendix C: Elements of the ISO 14001 Standard: A Snapshot	108
Appendix D: Excerpts from NSF's EMS Self-Assessment Tool	109

I. FOREWORD

The ISO 14000 series of standards, in particular the ISO 14001 Standard for environmental management systems (EMS), has become one of the most widely discussed developments in environmental management in both the private and public sectors. The ISO 14001 Standard was officially approved in September 1996, and is expected to become as pervasive in the international marketplace as the ISO 9000 series of quality management standards. This expectation has driven many organizations to devote significant resources into preparing for ISO 14001. Despite this level of investment, there is still a great deal of uncertainty about the implementation of the ISO 14001 Standard. Although several organizations in Europe have completely implemented a formal EMS based on standards (e.g., BS 7750, EMAS, IS 310), relatively few organizations in the United States have done so. Therefore, in the U.S. there is a need for "real life" examples from organizations about the challenges and benefits of implementing an EMS and the incentives for doing so.

This final report on NSF International's EMS Demonstration Project conveys the experiences of 18 organizations as they attempted to implement the ISO 14001 Standard from March 1995 through June 1996. The project was funded through a cooperative agreement from the U.S. Environmental Protection Agency (EPA), Office of Wastewater Management. The report will be of interest to many types of organizations interested in EMS implementation, including: manufacturers and other organizations considering whether to implement the Standard; regulatory agencies; engineering and management consulting firms; law firms; training organizations; banks; and insurance companies.

The Demonstration Project focused on EMS implementation issues, not on registration. In this report, "EMS implementation" refers to an organization's effort to develop an EMS based on the ISO 14001 Standard; the term does not refer to maintaining and improving the system after it is implemented. Participating organizations varied significantly in the extent to which they came into the project with the elements of ISO 14001 already in place.

The organizations, which participated voluntarily, were not required or expected to become registered to ISO 14001 during or after the project; nor were they required to implement all the requirements of the Standard over the course of the project.

Organization of The Report

The **Introduction and Project Overview** outlines the activities of the project in some detail and provides an overview of the 18 organizations that participated. The section on **EMS Implementation Progress** provides an analysis of how the project participants as a group made progress on implementing the ISO 14001 Standard over the course of the project. The **Findings on Key EMS Implementation Issues** discusses several EMS implementation issues, including

incentives, benefits, and keys to success. It also offers a list of suggested EMS implementation guidance tools. A brief **Conclusions** section discusses major lessons learned from the project and suggested areas for further inquiry. The **Case Studies**, which were written by the participating organizations and edited by NSF, convey the EMS implementation experiences of the participants from their own viewpoints (to maintain confidentiality, none of the other sections of the report refer to specific organizations by name). **Appendices A-D** are provided to help clarify certain parts of the project and this report. For those readers who are not familiar with the ISO 14001 Standard, it may be helpful to refer to Appendix C which provides an overview of the elements of ISO 14001.

Advice to Readers

This report assumes a basic knowledge of ISO 14000 and of the ISO 14001 EMS Standard. A thorough understanding of environmental management systems is helpful, but not required. For those who are not very familiar with the language of ISO 14001, it is suggested that the Standard be referenced regularly while reading the report.

Acknowledgments

NSF International would like to thank the U.S. EPA, Office of Wastewater Management, for providing the majority of the funding for the EMS Demonstration Project.

NSF also wishes to thank the 18 participating organizations (and the individuals who represented them in the project) for their invaluable contributions through the case studies, self-assessments, meeting presentations, and advice to NSF project staff (the organizations are listed in Section III of the report). NSF would also like to gratefully acknowledge the following individuals who have given much of their time to the planning and implementation of the EMS Demonstration Project, and who have contributed to the project's success:

Thomas Ambrose, HS&E Management Advisor
Henry Balikov, TLI Systems
Joe Egan, Tucker Alan, Inc.
Jimmy Margolis, Arthur D. Little, Inc.
Philip Stapleton, Glover-Stapleton Associates, Inc.
Wayne Tusa, Environmental Risk & Loss Control, Inc.
David Van Wie, Robert G. Gerber, Inc.

Finally, the author would like to thank Anita Cooney and Michael Hix of NSF International for their assistance in the development of this report.

II. EXECUTIVE SUMMARY

Project Overview

This final report on NSF International's Environmental Management Systems (EMS) Demonstration Project summarizes the EMS implementation experiences of 18 organizations of a variety of types and sizes. The project, which used the ISO 14001 Standard as the model for an EMS, was funded through a two-year grant from the U.S. Environmental Protection Agency, Office of Wastewater Management (October 1994 - September 1996). The EPA funded the project because it recognized that both private organizations and regulatory agencies were in need of practical information about the process of implementing the ISO 14001 Standard. Participating organizations included 16 private companies, one government agency, and one government-owned corporation (the U.S. Postal Service). The companies ranged from small manufacturers with fewer than 100 employees to multinational corporations.

The goals of the project were to: (1) document the experiences of a variety of organizations as they attempted to develop an EMS based on ISO 14001; (2) demonstrate the benefits and challenges of, and incentives for, EMS implementation; (3) determine what types of tools and assistance organizations need to be successful with EMS implementation; and (4) provide a forum for organizations to learn from each others' EMS experiences. Another important objective of the project was to identify and assess any differences that might exist between small and large organizations in their ability to implement an EMS.

After organizations were recruited for the project, an initial training session was held in March 1995 to familiarize participants with ISO 14000 and EMS. Following the training, participants conducted self-assessments of their EMS against the requirements in ISO 14001 using a self-assessment tool developed by NSF International. Three additional meetings were held (in August and December 1995, and June 1996) during which participants shared lessons learned from their EMS implementation experiences. Final EMS self-assessments were conducted prior to the last meeting in June 1996. In August 1996, participants submitted responses to specific questions as well as self-written EMS implementation case studies (the case studies are included in the report). In October 1996, EMS auditors conducted independent EMS assessments for four of the participants to determine if significant differences might exist between the results of the self-assessments and independent assessments.

To meet the objectives of the project, NSF collected and analyzed information from four sources: (1) results of the initial and final EMS self-assessments, and of the four independent assessments; (2) responses to the specific questions about EMS implementation; (3) the self-written case studies; and (4) observations made at the four project meetings.

Project Findings

EMS Implementation Progress

The results of the EMS self-assessments showed that, overall, participants made notable progress on implementing the ISO 14001 Standard over the course of the project (the average period of time between the initial and final self-assessments was approximately 11 months). Whereas the initial self-assessments showed that the group as a whole had only 22% of the requirements of the Standard complete, the final self-assessments showed that the group had 50% of the requirements complete.

Important Note: For both the initial and final self-assessments, participants evaluated themselves on 63 requirements which comprise all 17 elements of ISO 14001. Each requirement could be evaluated on five different levels: No Action (NA), Initiation (IN), Partial Implementation (PAR), Complete Implementation (COM), and Evaluated & Sustained (ES). NA, IN and PAR are considered incomplete, while COM and ES are considered complete (in the self-assessment tool, incomplete was denoted by "NO," while complete was denoted by "YES").

As a whole, participants also made progress on each of the 17 elements of ISO 14001, although more progress was made on some elements than on others. The element of ISO 14001 with the highest level of implementation was *Policy*, while *EMS audit* was least implemented (84% of the requirements under *Policy*, and 24% under *EMS audit*, were evaluated as complete at the conclusion of the project).

The results of the independent assessments showed that there were significant differences in how the organizations and independent auditors evaluated the requirements of ISO 14001. Approximately 30% of the requirements evaluated in the four organizations were evaluated differently by the organization and the independent auditor on the YES/NO response. Twenty-four percent were rated lower by the independent auditors; i.e., the independent auditor evaluated these requirements as NO, but the organization evaluated them as YES. Six percent were rated higher; i.e., the independent auditor evaluated these requirements as YES, but the organization evaluated them as NO.

Since 24% of all the requirements were evaluated lower by the independent assessors, and only 6% were evaluated higher, these findings suggest that the %YES of the initial and final self-assessment results would have been lower if all the EMS assessments had been conducted by independent auditors rather than by the organizations themselves.

The independent auditors made some additional observations during the audits. Most notably, in the three organizations with ISO 9000 systems, the quality management staff was surprisingly disconnected from the environmental management staff. It appeared that the organizations were not taking full advantage of their existing ISO 9000 systems to develop EMS procedures and documentation.

Incentives for Implementing an EMS

Participants were asked at the end of the project to list their organizations' incentives for implementing ISO 14001. The incentives most commonly cited by participants are listed below. The number of participants that cited each incentive is provided in parentheses (note: fourteen participants listed their incentives, and some cited more than one incentive):

- Competitive advantage (7);
- Improved environmental performance (6);
- Possible ISO 14001 registration (5);
- Enhanced regulatory compliance (4); and
- Possible regulatory flexibility (3).

Competitive advantage was also mentioned quite frequently at meetings, although participants did not always specify whether the advantage would be derived from external recognition (i.e., through registration) or from the benefits of improved environmental management.

Benefits of EMS Implementation

Several benefits of implementing an EMS were realized by participants over the course of the project. In addition, those organizations which had extensive EMSs at the beginning of the project reported benefits they had realized before becoming involved in the project. The number of participants that cited each benefit is provided in parentheses (note: fourteen participants listed benefits, and some listed more than one). Reported benefits include:

- Improved cooperation and environmental awareness among employees (5);
- Improved procedures and documentation (5);
- Enhanced regulatory compliance (3); and
- Improved environmental performance (5).

Participants had not realized reduced environmental management costs or access to international markets by the conclusion of the project. Although these benefits are often mentioned in conjunction with ISO 14001, it will likely take more time for organizations to realize these benefits.

Keys to Successful Implementation

The following keys to successful EMS implementation emerged as common themes during the group meetings and in participants' responses to questions at the conclusion of the project. These include:

- Secure top management commitment early in the process;
- Gain a thorough understanding of the ISO 14001 Standard;
- Perform a thorough self-assessment;
- Involve many functions and staff levels in the planning process;
- Initially, set a small number of achievable environmental objectives; and
- Build on existing business practices.

Links with ISO 9000 and Health & Safety

A majority of project participants have facilities that are either registered to ISO 9000 (ISO 9001 or 9002) or working towards registration (only two organizations reported that they were not registered or pursuing registration). Most of the organizations with ISO 9000 experience indicated that they would model several elements of the EMS after their quality system, or that they would at least partially integrate certain elements of ISO 9000 and ISO 14001. However, only a few participants reported at the end of the project that they intended to fully integrate the two systems in the near future. This finding is consistent with observations made during the independent assessments.

Six participants reported they were intending to integrate ISO 14001 with their health & safety program.

Comparison of SMEs and Large Organizations

In the Demonstration Project, small and medium-sized enterprises (SMEs) were defined as having fewer than 1,000 employees organization-wide. Based on question responses from both SMEs and large organizations in the project, some differences between the two types of organizations were observed.

Incentives. For certain incentives identified by participants (i.e., competitive advantage, regulatory relief) there was not a clear difference between the proportion of SMEs and large organizations citing them as incentives. However, for other incentives there were notable differences. SMEs were more likely than large organizations to identify enhanced compliance and improved documentation as motivating factors. Large organizations, on the other hand, were more likely to identify improved environmental performance and pollution prevention as motivating factors.

Barriers. SMEs and large organizations cited most EMS implementation barriers (e.g., promoting the EMS concept within the organization, achieving thorough documentation) in roughly equal proportions. However, a much greater proportion of SMEs cited lack of time and resources as a barrier.

Recommended Guidance and Implementation Tools

Based on the experience of the organizations in the project, it became evident that certain types of guidance are very important for organizations of all types and sizes attempting to implement ISO 14001. These include:

- Clarification of the intent of ISO 14001;
- A checklist or other tool to conduct an EMS self-assessment;
- Guidance on how to identify and assess the significance of environmental aspects and impacts;
- A step-by-step implementation guide;
- Examples of EMS manuals, policies, and procedures; and
- EMS implementation case studies.

Feedback on the ISO 14001 Standard, and Advice to Regulators

Participants reported on their general and specific concerns about the ISO 14001 Standard. In general, the participants believed that the Standard was a good model for an EMS. However, most participants expressed at least one overriding concern about the Standard, and some specific comments (specific comments are presented in section V of the report). The greatest overriding concern was the potential for certain requirements to be variably interpreted by different auditors. Other commonly reported concerns included confusion over the definition of "environmental aspects;" an overemphasis on documentation; and confusion about whether written procedures were necessary for particular requirements.

Participants also offered comments to the regulatory community about how government agencies should integrate ISO 14001 into their regulatory approaches. Most participants stated that regulators should offer incentives -- primarily "regulatory flexibility" -- to companies that implement an EMS. These proposed incentives included:

- Reductions in reporting;
- Reductions in site inspections and audits;
- Reductions in fines;
- Elimination of penalties and NOVs for various environmental compliance issues; and
- Fast-track permitting.

Many participants expressed a concern about the voluntary disclosure of self-audits (ISO 14001 requires organizations to conduct, and maintain the records of, EMS audits). Several participants also commented that a greater level of trust was needed between regulators and the regulated community.

Conclusions

Implementing ISO 14001 is Feasible in a Wide Variety of Organizations

The experience of the Demonstration Project suggests that an EMS based on ISO 14001 can be implemented in a wide variety of organizations, but varying amounts of guidance and assistance are required for different organizations. The main factors that seem to determine an organization's ability to implement an EMS are (1) its experience with EMS, ISO 9000, or other management system concepts; (2) the level of commitment from its top management; and (3) the resources available to the organization to develop the necessary procedures and documentation. Since SMEs are more likely to lack adequate resources, they will probably require more guidance and take longer to complete EMS implementation than large organizations.

EMS Implementation Can Bring Concrete Internal Benefits

Project participants reported many benefits from EMS implementation that were not market or trade related, including enhanced environmental awareness, improved documentation, and pollution prevention. These benefits were realized within the one year time frame of the project, and before any of the organizations had attained full implementation or registration.

Independent Assessments Can Provide an Important Check on Self-Assessments

The results of the independent EMS assessments suggest that organizations might have the tendency to evaluate their systems higher than would independent auditors. The results may also have important implications for the concept of "self-declaration," in which an organization would declare itself to be in conformance with the ISO 14001 Standard rather than receive an independent audit from a registrar.

III. INTRODUCTION AND PROJECT OVERVIEW

In October 1994, the U.S. EPA, Office of Wastewater Management, awarded funding to NSF International to manage the EMS Demonstration Project. EPA awarded the grant because it recognized that both private organizations and regulatory agencies needed practical information about the EMS implementation process in organizations of various types and sizes. NSF was selected to manage the project because it had developed an interim EMS standard (NSF 110) very similar to ISO 14001, and because NSF was an active participant in the ISO 14000 development process.

The goals of the project were to: (1) document the experiences of a variety of organizations as they attempted to develop an EMS based on ISO 14001; (2) demonstrate the benefits and challenges of, and the incentives for, EMS implementation; (3) determine what types of tools and assistance organizations need to be successful with EMS implementation; and (4) provide a forum for organizations to learn from each others' EMS experiences. An important objective of the project was to identify and assess any differences that might exist between small and large organizations in their ability to implement an EMS (for the remainder of this report, smaller organizations will be referred to as small and medium-sized enterprises, or SMEs). In part, this objective was intended to address concerns which arose during the Standard development process regarding the applicability of ISO 14001 to SMEs.

The intent of the project was to examine the process of implementing an EMS based on ISO 14001. It was not within the scope of the project to measure or assess the effects of EMS implementation on environmental compliance or other aspects of environmental performance. It was also not required or expected that participating organizations would become registered to ISO 14001 during or after the project. It is important to note that this report attempts to focus on the experience of implementing an ISO 14001 EMS, as opposed to the benefits of already having one in place. However, those participants which came into the project with most ISO 14001 elements in place reported on the experience of having an established EMS as well as on the experience of implementing certain requirements. Nevertheless, most of the feedback received from the participants addressed their experiences with the process of implementing the EMS.

Project Summary

Project participants were recruited in late 1994 and early 1995. A project announcement and interest form were sent to approximately 1,000 organizations. A few organizations were also recruited individually. A maximum of 20 organizations were sought, and 18 were recruited (there was no competitive selection process; i.e., all 18 organizations that expressed interest were selected for the project). There was no fee charged for participation.

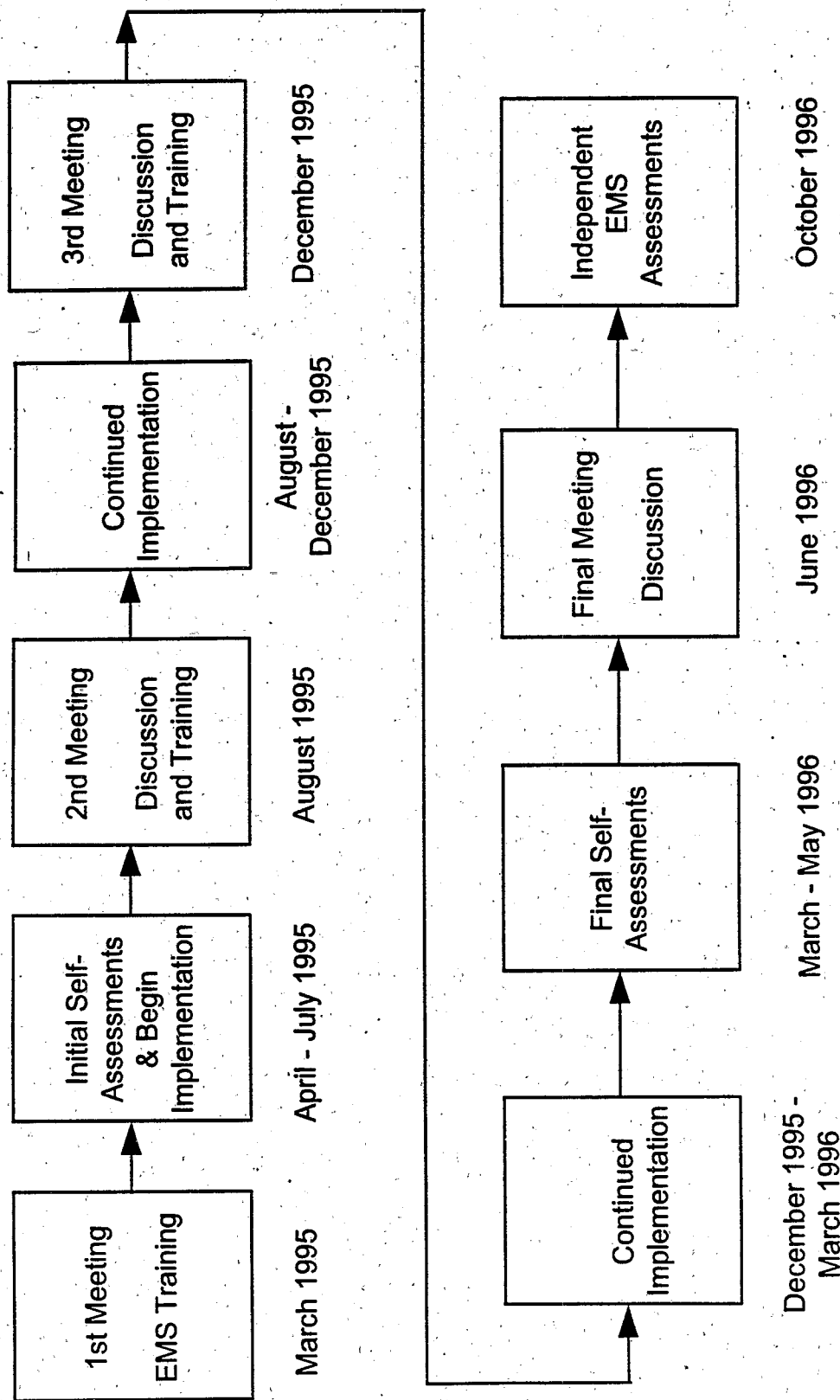
The project consisted of two major activities: (1) EMS self-assessment and implementation; and (2) group training and discussion. Each participant performed an initial assessment of its EMS in the spring of 1995 using NSF's EMS Self-Assessment Tool. The participants used the results of their initial assessments to develop EMS implementation action plans. Based on their action plans, participants implemented the ISO 14001 Standard at their own pace. Each participant conducted a second self-assessment in the spring of 1996 to determine progress made over the course of the project. Following the final self-assessments, four participants received independent EMS assessments conducted by EMS auditors. The results of these assessments were compared to the final EMS self-assessments for the four participants. The purpose of the independent assessments was to determine if organizations might evaluate their own systems differently than independent auditors would.

In addition to self-assessment and implementation, the organizations convened in four meetings at NSF to receive training on EMS implementation and to discuss practical implementation strategies. Based on feedback received from participants, these meetings were a very constructive way to exchange ideas about EMS concepts.

At the conclusion of the project, participants submitted responses to a series of questions regarding their EMS implementation experiences; these responses are summarized in Section V, Findings on Key EMS Implementation Issues (the questions are listed in Appendix B). Participants also prepared self-written case studies which are included in Section VII. (Note: 14 of the 18 organizations submitted question responses regarding their EMS implementation experiences; 17 submitted case studies).

Figure I provides an overview of the project.

Figure 1
EMS Demonstration Project
Activities at a Glance



Project Activities in Detail

EMS Self-Assessments and Implementation

Each participant performed two EMS self-assessments, one in the spring of 1995 (following the first meeting) and one in the spring of 1996 (before the last meeting).

The results of the self-assessments were aggregated and summarized to serve two purposes: (1) to provide an internal benchmark for the group; and (2) to measure group progress over the period of the project.

Self-assessments were conducted internally by the organizations (some had consultants assist with the self-assessment, others did not) using NSF's EMS Self-Assessment Tool. The tool was developed prior to the first meeting under the direction of an ad hoc advisory group. The group was comprised of environmental management consultants, in addition to environmental managers from some of the companies recruited to the project. The tool contains a checklist that allows the user to assess how the organization's EMS compares to the requirements in ISO 14001. The self-assessment results and a brief description of the EMS Self-Assessment Tool are provided in Section IV.

Following the initial self-assessments in the spring of 1995, each participant identified those EMS elements it wanted to develop (please refer to Section IV for an explanation of the self-assessment process). While some of the organizations already had several elements of ISO 14001 already in place, others needed to make more substantial changes to their existing environmental management practices to develop an ISO 14001 EMS. As mentioned previously, participants were not required to implement any particular requirements of the Standard in any specific time frame. Rather, they were asked to make the best effort possible, based on their own priorities, over the course of the project.

Group Training and Discussion

Group meetings were held at NSF International in March, August and December of 1995, and in June of 1996. The purpose of these meetings was to provide EMS training and to create a forum in which participants could learn from each other. Each organization was represented at the meetings by one to three individuals. The attendees served a variety of roles in their organizations including company presidents, environmental managers, and quality managers. The first three meetings were two-day sessions, while the last meeting was a one-day session.

The first meeting provided training on the requirements of ISO 14001 and included an overview of basic EMS concepts. NSF's EMS Self-Assessment Tool was provided to each participant at the meeting so that each organization could conduct a self-assessment of its EMS before the

second meeting. At the conclusion of the first meeting, participants were asked to make their best effort to implement the requirements of ISO 14001 over the course of the project, and were encouraged to do so at a pace appropriate to their individual situations.

The second meeting provided further training on specific topics related to EMS implementation, including: identifying environmental aspects and impacts; setting environmental objectives and targets; promoting the EMS concept within an organization; and integrating ISO 14001 with ISO 9000. In addition, each participant reported back to the group on its experience with the EMS self-assessment and on progress it had made in implementing the requirements in the Standard. Individual progress reports (each about 10-15 minutes) were followed by questions from the group and discussion. For both the training and report-back sessions, participants were broken into smaller groups to facilitate discussion.

The third meeting was similar to the second, but more time was devoted to feedback and discussion than to training. Each participant presented its progress on EMS implementation, and discussed keys and barriers to success. Following the progress reports, plenary workshops were held on estimating the costs and benefits of EMS implementation, and on evaluating environmental performance. In addition, guest speakers updated the group on developments in EMS registration and accreditation. In the fourth meeting, the majority of the agenda was devoted to sharing keys and barriers to EMS implementation, and lessons learned over the course of the project.

Profile of Participating Organizations

Ten of the 18 participating organizations are large, and eight are SMEs (for the purpose of categorization, large organizations were defined as having over 1,000 employees organization-wide, while SMEs were defined as having fewer than 1,000 employees organization-wide). The organizations provide a variety of products and services, and range from Fortune 100 corporations to small manufacturers. At the outset of the project, the organizations also varied significantly in their approach to environmental management. In particular, they varied in the extent to which procedures were formalized and documented, and in the extent to which activities that go beyond regulations had been integrated into their existing environmental management practices.

A majority of the participants are either registered to ISO 9000 or working towards registration. Approximately one-half operate facilities overseas. Table I lists the 18 organizations that participated in the project. They consist of 16 private companies, 1 government agency, and one government-owned corporation (the U.S. Postal Service). It is important to note that the organizations in the project, because they participated voluntarily, were likely inclined to make more progress on EMS implementation than would an average cross section of companies in the U.S.; most of the participants had already decided to pursue EMS implementation before becoming involved in the project.

As of December 1996, two organizations (both companies) in the project had facilities that were registered to ISO 14001 or other EMS standards. Many others are planning to become ISO 14001 registered within the next few years. Others may not be specifically planning for registration, but are committed to developing an EMS based on the requirements of ISO 14001.

Table I: Brief Profiles of Participating Organizations

Organization	Headquarters	Products/Services*	Size**
3M Corporation	St. Paul, MN	Produces multiple products for the industrial, commercial, consumer, and health care markets	Large
Allergan, Inc.	Irvine, CA	Produces pharmaceuticals	Large
Commodore Applied Technologies	Columbus, OH	Performs remediation technology R&D	Small
Fluke Corporation	Everett, WA	Produces electronic test and measurement instruments	Large
Globe Metallurgical	Selma, AL	Produces silicon metal and ferroalloys	Med
Hach Company	Ames, IA	Produces instruments for water analysis	Med
K.J. Quinn & Co.	Seabrook, NH	Produces coatings and adhesives	Small
Lockheed Martin Federal Systems	Manassas, VA	Produces semiconductors and computer systems	Large
Madison Gas & Electric Company	Madison, WI	Provides electricity and natural gas	Med
Milan Screw Products	Milan, MI	Produces screw machine products	Small
NEO Industries Ltd.	Portage, IN	Performs metal finishing	Small
NIBCO Inc.	Elkhart, IN	Produces fluid handling products	Large
Pacific Gas & Electric	San Francisco, CA	Provides electricity and natural gas	Large
Pitney Bowes Inc.	Stamford, CT	Produces mailing systems and other office machines	Large
Prime Tanning Co.	Berwick, ME	Produces finished leather	Med
TRINOVA Corporation	Maumee, OH	Produces engineered components and systems for industry	Large
U.S. Postal Service	Washington, DC	Provides mail delivery services	Large
Washtenaw County Government	Ann Arbor, MI	Provides a variety of municipal services	Large

Note: Please refer to the Case Studies for a more detailed description of products/services.

Note: Small denotes fewer than 250 employees; Med denotes 250-1000 employees; Large denotes over 1000 employees (applies to entire organization).

IV. EMS IMPLEMENTATION PROGRESS

Background on EMS Assessments and Data Analysis

Self-Assessments

Progress on EMS implementation over the course of the project was measured by comparing the results of the initial and final self-assessments conducted using NSF's EMS Self-Assessment Tool. The initial self-assessments were conducted between April and July 1995, while the final self-assessments were conducted between March and May 1996 (thus, the average time between self-assessments was approximately 11 months). The analysis provided in this section reflects results for the entire group of organizations, not for individual participants. Of the 18 organizations in the project, 15 submitted data on both their 1995 and 1996 self-assessments; therefore, 3 of the 18 organizations are not included in the aggregate data analysis.

The EMS Self-Assessment Tool contains a checklist which breaks the 17 elements of ISO 14001 Standard down into 63 separate requirements. The checklist does not interpret the Standard, rather each requirement is taken verbatim from ISO 14001. The user evaluates each requirement on five possible "implementation levels": No Action (NA), Initiation (IN), Partial Implementation (PAR), Complete Implementation (COM), and Evaluated & Sustained (ES). If the requirement is evaluated as COM or ES, it is considered to be satisfied, or complete ("YES"); if the requirement is evaluated as NA, IN, or PAR, it is considered to be not satisfied, or not complete ("NO"). The reader should refer to Appendix D which provides a sample page of the assessment tool and detailed descriptions of each implementation level.

Because the final ISO 14001 Standard was published only recently (September 1996), the Self-Assessment Tool was based on the Draft International Standard (DIS). This does not affect the results of the project because there are no substantive differences between the DIS and the final version of the Standard.

A note regarding the initial self-assessments. The initial self-assessments were conducted using an assessment tool which contained the requirements of both the ISO 14001 draft and another EMS standard (NSF 110), while the final self-assessments used a revised self-assessment tool which contained only the requirements of the ISO 14001 draft. Participants were given the option to complete the initial assessment using NSF 110, ISO 14001, or both. Three participants did not complete the 14001 assessment; those organizations were asked to retroactively evaluate themselves on how their EMS would have compared to ISO 14001 in the spring of 1995. (Note: NSF 110 was developed by NSF International as an interim EMS standard in the U.S. The NSF standard was used in the initial phases of the project because, at the time, NSF 110 was a completed standard and ISO 14001 was in an earlier draft stage; as the project progressed and interest in ISO 14001 increased, a decision was made to use ISO 14001 in the project rather than NSF 110).

Independent Assessments

In October 1996, four project participants received EMS assessments conducted by independent EMS auditors. The assessments were conducted by experienced environmental auditors utilizing the same assessment tool used in the self-assessments. Each assessment took two days and was conducted by two auditors. Three of the assessments were conducted for single facilities, and one was conducted for an entire organization. As discussed below, there were significant differences between the results of the self-assessments and independent assessments for the four organizations in which independent assessments were conducted.

Self-Assessment Results

The initial and final self-assessment results were aggregated and analyzed to evaluate (1) overall implementation progress on the Standard as whole; and (2) implementation progress on each of the 17 elements of ISO 14001. As presented and discussed below, progress was made on the Standard as a whole and on all of the 17 elements.

Overall Progress on ISO 14001

A total of 945 self-assessment responses were analyzed (15 organizations x 63 requirements in assessment tool = 945 total responses). In the initial self-assessment, 22% of responses were "YES" (i.e., COM or ES) and 78% were "NO" (i.e., NA, IN, or PAR). However, in the final self-assessment, 50% of responses were "YES" and 50% were "NO." In Table II, these results are further broken down into the five implementation levels.

Table II: Overall Progress on ISO 14001 Implementation

Implementation Level	Initial Results	Final Results
No Action (NA)	25%	8%
Initiation (IN)	23%	15%
Partial Implementation (PAR)	30%	27%
Complete Implementation (COM)	18%	37%
Evaluated & Sustained (ES)	4%	13%

Table II also shows that participants, as a group, did not begin ISO 14001 implementation "from scratch," since only 25% of the requirements were evaluated as No Action initially.

There was a large variation amongst project participants both on EMS implementation progress and on the %YES of requirements for the initial and final self-assessments. Some participants evaluated well under 50% of their requirements as YES, while others evaluated well over 50% of their requirements as YES.

Table III shows the %YES of individual participants for both the initial and final self-assessments. Each column represents a participant (there are only 15 columns because 15 of the 18 project participants submitted both their initial and final self-assessments). The columns are ordered, from left to right, by the %YES in the initial self-assessments. These data illustrate the extent to which project participants varied in their levels of EMS implementation at both the beginning and end of the project. Note that only three of 15 showed no progress over the course of the project. The two negative results are likely due to the final self-assessments being more rigorous than the initial self-assessments in those two organizations.

Table III
EMS Implementation Progress of Individual Participants

Initial %YES	75	54	41	38	33	27	21	21	16	6	0	0	0	0	0
Final %YES	100	100	84	37	33	18	51	41	81	41	62	52	27	11	5
Final - Initial	25	46	43	-1	0	-9	30	20	65	35	62	52	27	11	5

Progress on the Individual Elements of ISO 14001

Table IV shows how the elements ranked for both the initial and final self-assessments in terms of the % of responses evaluated as "YES" within each element. The %YES was calculated by dividing the total number of responses in an element into the number of responses evaluated as "YES." For example, there are six requirements in the Self-Assessment Tool under Policy. Since 15 participants responded, there was a total of 90 responses for Policy. Seventy-six of the 90 responses (84.4%) were evaluated as "YES."

Table V shows the same information as Table IV, but in a different format. The 17 elements of ISO 14001 are ranked by the extent to which project participants made implementation progress on them over the course of the project. The difference between the initial and final self-assessment for each element is provided in the third column. For example, although 6.7% of responses for *Records* were evaluated as "YES" (COM or ES) in the initial assessments, 48.3% of responses were evaluated as "YES" in the final assessments.

Table IV
Ranking of ISO 14001 Elements -- Initial and Final Self-Assessments

ISO 14001 Elements -- Initial Rank	% YES Initial	ISO 14001 Elements -- Final Rank	% YES Final
4.3.2 Legal and other requirements	53.3	4.2 Environmental policy	84.4
4.2 Environmental policy	44.4	4.3.2 Legal and other requirements	66.7
4.4.7 Emergency prep/resp	35.6	4.4.1 Structure and responsibility	61.7
4.4.1 Structure and responsibility	28.3	4.3.3 Objectives and targets	57.8
4.5.1 Monitoring and measurement	24.4	4.3.4 Environmental mgmt. program	57.8
4.3.3 Objectives and targets	22.2	4.4.7 Emergency prep/resp	57.8
4.4.3 Communication	22.6	4.4.2 Training/awareness/competence	56.7
4.4.6 Operational control	20.0	4.3.1 Environmental aspects	48.9
4.6 Management review	20.0	4.4.6 Operational control	48.3
4.4.5 Document control	19.0	4.5.3 Records	48.3
4.4.2 Training/awareness/competence	18.9	4.4.5 Document control	43.8
4.3.4 Environmental mgmt. program	17.8	4.5.1 Monitoring and measurement	40.0
4.3.1 Environmental aspects	15.6	4.6 Management review	37.8
4.5.2 Nonconf/corr&prev action	13.3	4.4.4 EMS documentation	36.7
4.5.4 EMS audit	13.3	4.4.3 Communication	35.6
4.4.4 EMS documentation	10.0	4.5.2 Nonconf/corr&prev action	31.1
4.5.3 Records	6.7	4.5.4 EMS audit	24.0

Table V
Implementation Progress on Individual ISO 14001 Elements

ISO 14001 Element	Initial %YES	Final %YES	Final minus initial
4.5.3 Records	6.7	48.3	41.6
4.2 Policy	44.4	84.4	40
4.3.4 Environmental mgmt program	17.8	57.8	40
4.4.2 Training/awareness/competence	18.9	56.7	37.8
4.3.3 Objectives and targets	22.2	57.8	35.6
4.4.1 Structure and responsibility	28.3	61.7	33.4
4.3.1 Environmental aspects	15.6	48.9	33.3
4.4.6 Operational control	20.0	48.3	28.3
4.4.4 EMS documentation	10.0	36.7	26.7
4.4.5 Document control	19.0	43.8	24.8
4.4.7 Emergency preparedness/resp	35.6	57.8	22.2
4.5.2 Nonconformance/corr&prev action	13.3	31.1	17.8
4.6 Management review	20.0	37.8	17.8
4.5.1 Monitoring and measurement	24.4	40.0	15.6
4.3.2 Legal and other requirements	53.3	66.7	13.4
4.4.3 Communication	22.2	35.6	13.4
4.5.4 EMS audit	13.3	24.0	10.7

It is difficult to draw hard conclusions from Tables IV and V because many factors may contribute to why certain ISO 14001 elements were more developed than others at the beginning of the project, or why organizations addressed certain elements of the Standard before others. However, a few observations from Tables IV and V are provided below.

Policy was evaluated the highest in implementation in the final assessment (84.4%) and the second highest in the initial assessment (44.4%). Moreover, *Policy* was ranked 2nd in progress. *EMS audit*, on the other hand, was evaluated quite low in both the initial assessments (13.3%) and final assessments (24.0%). It is perhaps not surprising that *Policy* was ranked high. However, it is unclear why *EMS audit* was ranked so low. One possible reason is that

organizations may choose to wait until most other EMS elements are in place before developing an EMS audit program. Another possible reason is that organizations may tend to rate themselves down on this element because they have not yet performed an audit, even if they have the procedures in place.

Although *Records* was evaluated the lowest in the initial assessments (6.7%), the greatest progress was made on that element (up to 48.3%). On the other hand, *Legal and other requirements*, which received the highest evaluation initially (53.3%), made relatively little progress over the course of the project (up to 66.7%). It is not clear what factors may have contributed to these results.

Environmental aspects was ranked quite low in the initial assessment (15.6%), but significant progress was made over the course of the project (up to 48.9%). The low initial evaluation for this element likely reflects that most organizations have not yet attempted to conduct a formal assessment of their environmental aspects and impacts because doing so is not required under traditional command and control. The significant progress made over the course of the project is probably due to the fact that many participants recognized the importance of identifying environmental aspects and impacts early on in the EMS implementation process.

Findings from Independent Assessments

This section discusses the results of the four independent EMS assessments performed in October 1996. First, the aggregate findings are analyzed. Then, several examples are given of specific requirements where there were differences between the self-assessments and independent assessments. Finally, some additional observations from the independent assessments are discussed.

Aggregate Results

For the four organizations receiving independent assessments, a total of 252 requirements were evaluated (4 x 63 requirements in assessment tool = 252). The evaluations were analyzed by identifying all those requirements for which there were differences on the YES/NO response between the self-assessment and independent assessment. The analysis showed that approximately 76 of the 252 requirements, or 30%, were evaluated differently on the YES/NO response. Twenty-four percent (61 out of 252) were rated lower by the independent auditors; i.e., the independent auditor evaluated these requirements as NO, but the organization evaluated them as YES. Six percent (15 out of 252) were rated higher; i.e., the independent auditor evaluated these requirements as YES, but the organization evaluated them as NO. Notably, 13 of the 15 requirements evaluated higher were in one organization.

These differences were distributed throughout the Standard. All of the 17 elements of ISO 14001

showed at least one of the four organizations with a difference on the YES/NO response. Moreover, 51 of the 63 requirements showed at least one organization with a difference on the YES/NO response; however, for only three of the 63 requirements did three or more of the four organizations have differences on the YES/NO response.

The most notable differences in the Standard between the self-assessments and independent assessments were found in the sections on *Objectives and targets* and *Environmental management program*. In *Objectives and targets*, five out of the 12 responses were evaluated lower, while two were evaluated higher. The most significant differences were found in the language requiring organizations to consider their significant environmental aspects and the views of interested parties when setting environmental objectives. In *Environmental management program*, seven out of 12 responses were evaluated down, while none were evaluated up. The most significant differences in this section were found in the language requiring organizations to include the means and time-frame by which objectives and targets will be achieved.

Since 24% of all the requirements were evaluated lower, and only 6% were evaluated higher, these findings suggest that the %YES of the initial and final self-assessment results would have been lower if all the EMS assessments had been conducted by independent auditors rather than by the organizations themselves. And because seven out of 12 responses in the *Environmental management program* section of the Standard were evaluated lower, this section in particular may have been evaluated too high in the self-assessments. These findings do not imply, however, that less overall progress was made over the course of the project, since any "self-assessment bias" would have been a factor in both the initial and final self-assessments. In fact, there was likely more bias in the initial self-assessments because the organizations' understanding of the Standard was probably not as thorough. This suggests that the overall progress may have actually been greater than the observed difference, even though the initial and final %YES may have been lower than reported in the self-assessments.

Specific Examples from the Standard

Two types of differences were observed between the self-assessments and independent assessments:

- differences in how the organization and the auditors interpreted the intent of ISO 14001 requirements; and
- differences in opinion on what environmental management practices satisfied particular ISO 14001 requirements. (Note: this could be the case even if there is agreement between the organization and the auditors on the intent of the Standard).

A small number of differences found between the self-assessments and independent assessments were due to auditor oversights.

Most of the differences appeared to fall under the second type -- differences in opinion -- but in many cases it was difficult to differentiate between interpretation and opinion since the two are so closely linked. However, in some cases the differences could be explained fairly clearly by one type or the other. A few examples of each case are provided below.

Differences in Interpretation. One organization's *Environmental policy* did not have the terms "prevention of pollution" or "pollution prevention," rather, it had the terms "waste management" and "waste minimization." While the independent auditors felt that the word "prevention" was required, the organization believed that "minimization" was sufficient. Therefore, the organization evaluated itself as COM on this requirement, while the auditors evaluated it as PAR on the requirement.

Another organization was evaluated higher on several requirements due to a different interpretation of the Standard. The reason for the auditors evaluating these requirements higher than the organization did was the same in each case. The organization believed that several requirements could not be complete (i.e., COM or ES) because they had not implemented every element of the ISO 14001 Standard. For example, in *Structure and responsibility*, the organization evaluated itself as PAR on the requirement that management provide "essential resources;" it did so because it did not have a specific budget item for an ISO 14001 EMS. The auditors, however, evaluated this requirement as COM because they had observed that the existing EMS was being adequately resourced.

Also in *Structure and responsibility*, the organization evaluated itself as NA (No Action) on the requirement that the management representative report EMS performance to top management. It reasoned that it could not report on the EMS because it did not yet have an ISO 14001 EMS. Again the auditors evaluated this requirement as COM because the management representative was in fact reporting regularly to top management on the performance of the existing EMS. The same type of situation occurred in the sections on *Training, awareness and competence* and *Management review* in which the organization evaluated itself as NO on certain requirements, while the auditors evaluated the organization as YES on those requirements.

Differences in Opinion. Under *Objectives and targets*, one organization was evaluated lower on the requirement that significant environmental aspects be considered in establishing and reviewing objectives and targets. In the judgement of the auditors, the objectives and targets did not adequately address the organization's significant environmental aspects. Unlike with the above examples, this YES/NO difference was not

caused by differing interpretations of the Standard; both the organization and the auditor agreed that significant aspects were considered, but the auditors felt that aspects had not been considered adequately. In the same organization under *Document control*, the auditors evaluated lower the requirement that "documentation shall be legible, dated, and readily identifiable..." because the organization had not placed footers on each page of controlled documents to prevent copying pages out of context. This reflects a difference in judgement about what constitutes an effective document control system, rather than a difference in interpretation of the requirement.

In another organization, under *Training, awareness and competence*, the auditors evaluated lower the requirement that "training needs be identified" because the organization had not indicated who would be responsible for identifying those needs. Again, this difference is more a matter of judgement or opinion than interpretation, since it does not state in the Standard that the organization must specify the individual who is responsible for identifying training needs.

Additional Observations

Following the independent assessments, the audit teams were asked to report any additional observations regarding the four organizations' EMS implementation processes. They observed two areas with which the organizations appeared to be most challenged: (1) EMS planning; and (2) taking advantage of the existing ISO 9000 system to help develop EMS procedures and documentation.

The auditors found that, as a whole, the four organizations were having more difficulty with EMS planning (with the exception of *Legal and other requirements*) than with the other parts of the Standard. Although all the organizations had at least some of the planning requirements in place, each organization needed to make improvements in several areas. For example, one organization had not considered all of its activities, products or services in identifying its environmental aspects. Another organization had set objectives and targets, but had not communicated them to upper management. A third organization had identified significant environmental aspects and set objectives and targets, but had not adequately identified the means and time-frame for achieving the objectives and targets.

The auditors also found that those organizations with ISO 9000 systems (three of the four organizations were registered to ISO 9000) were not taking full advantage of their internal expertise in management systems to prepare procedures and documentation for the EMS. In all three cases, the environmental manager responsible for the EMS was surprisingly disconnected from the activities of the ISO 9000 staff. For example, in one organization the environmental manager was not aware that certain environmental procedures had already been incorporated into the ISO 9000 system.

V. FINDINGS ON KEY EMS IMPLEMENTATION ISSUES

The primary source of information for this section is the set of question responses submitted by 14 participants at the conclusion of the project. The questions (which are listed in Appendix B) were open-ended; i.e., information was not collected through a formal survey that provided response choices. This section also draws, to a limited extent, on information presented in the self-written case studies and on observations made by project staff during the four meetings held at NSF International.

Incentives for Implementing an EMS

There are many reasons why project participants decided to develop an EMS based on ISO 14001. The major incentives cited by participants are discussed below (note that incentives should be differentiated from benefits, which is discussed later in this section).

Competitive Advantage

Most participants believed that implementing an EMS will be important in maintaining or gaining competitive advantage (seven of the organizations reported that competitive advantage was an incentive for implementing an EMS, and competitive advantage was discussed frequently at the meetings). However, participants did not always specify whether the advantage would be derived from external recognition (i.e., registration) or from the benefits of improved environmental management. For some participants, the anticipated competitive advantage may have been different among departments in the organization. For example, two participants reported that the environmental management department believed that competitive advantage would be derived from improved environmental management, while upper management believed that competitive advantage would derive from external recognition.

Although competitive advantage can be viewed as an obvious incentive (i.e., an organization would not implement an EMS if it believed that doing so would not in some way lead to competitive advantage), it is discussed here because it was mentioned quite frequently throughout the project.

Improved Environmental Performance

Six of the participants cited improved environmental performance as a reason for implementing the ISO 14001 Standard. These organizations view the EMS as a good way to identify pollution prevention opportunities and encourage continual improvement of environmental performance. As discussed below under Benefits and Costs, several participants did realize improvements in

environmental performance as a result of implementing an EMS.

Possible ISO 14001 Registration

Preparing for possible ISO 14001 registration was cited by five of the project participants as an incentive for implementing an EMS. Anticipating the need for ISO 14001 registration is important for companies that sell products internationally or operate facilities overseas. It is believed by many that ISO 14001 registration could become a de facto requirement in international markets and in the U.S. marketplace as well. Registration is also seen by some companies as a potential way to demonstrate environmental performance to customers and other stakeholders including regulators, insurance companies, and community groups.

Two participants stated that implementing ISO 14001 would be an effective way to demonstrate good environmental practices externally, even though they did not tie that potential benefit directly to registration.

Enhanced Regulatory Compliance

Four participants cited enhanced regulatory compliance as an important reason they were implementing an EMS. Some participants viewed an EMS as a mechanism for cost-effectively maintaining compliance. Twice as many participants (eight) reported at the end of the project that they believed implementing an EMS would in fact improve their compliance management. It should be noted that the participants generally had very good systems to manage compliance before the project began.

Possible Regulatory Flexibility

The term "regulatory flexibility" is used to describe regulatory changes such as fewer inspections, reduced fines, and expedited permitting. Many organizations are hoping that having both a solid compliance record and a proactive EMS will result in regulators focusing efforts on organizations with significant compliance problems. Currently, regulatory flexibility appears to be a fairly weak incentive (although three project participants did cite it as an incentive) because regulatory agencies have not yet determined how to integrate ISO 14001 into their regulatory programs. If regulators determine that regulatory flexibility can be effectively linked to ISO 14001, and if agencies begin to make significant changes, then regulatory flexibility may become a much stronger incentive than it is now.

Benefits and Costs of Implementation

Every organization faced with the decision of whether or not to implement ISO 14001 must estimate the potential benefits and costs. However, accurately predicting the actual benefits and costs can be quite difficult. An organization may rely on its previous experience with ISO 9000 or other management systems to estimate EMS benefits and costs, or it may look at the experiences of other organizations.

A common question asked about ISO 14001 is, "What are the benefits and costs of implementing the Standard?" This question is difficult to answer in general terms, because each organization will realize different benefits and costs based on a variety of factors. These factors include the size of an organization, and the environmental impacts of its activities, products, and services. An equally important factor is the extent to which an organization already has the elements of ISO 14001 in place. It is likely that an organization with the majority of ISO 14001 elements already in place before starting implementation will realize fewer benefits and incur fewer costs than a similar organization which had significantly fewer elements already in place. An organization's accounting methods can also affect the manner in which benefits and costs of EMS implementation are calculated.

Benefits of Implementation

Measuring the benefits of EMS implementation can be challenging. Even for those benefits that are seemingly measurable (e.g., environmental management cost-savings), it can be difficult for an organization to conclude that the EMS alone is responsible for a given outcome given all the other changes occurring in the organization. For example, one organization in the project said that it had identified some specific environmental management cost-savings while implementing the EMS, but the organization could not pinpoint to what extent EMS implementation was responsible for the improvement.

At the conclusion of the project, organizations began to realize some benefits of their efforts. Most of these benefits were recognized between the third and fourth meetings (i.e., between December 1995 and June 1996), about one year after the beginning of the project. A few participants realized some benefits that they had not anticipated at the beginning of the process.

Below is a discussion of the types of benefits participants reported they had realized (or not realized) at the conclusion of the project. It is important to keep in mind that although most of these benefits were realized over the course of the project during the ISO 14001 implementation process, a few participants which already had well developed EMSs reported benefits they had realized before they became involved in the project. It appears likely that many of the organizations will realize further benefits over future business cycles.

Improved Cooperation and Environmental Awareness Among Employees

Five participants reported that the EMS had enhanced awareness of environmental issues among its employees. Enhanced awareness had resulted in improved employee morale, in addition to improved operations. One organization said, "people want to do the right thing in the correct manner but need to be made aware of the opportunities and methods available." The organization noted that the EMS had provided employees with the "opportunities and methods" to do the right thing. Another organization reported "an enhanced spirit of cooperation at the facility" which was attributable to the EMS. This organization commented that "perceptions that the work force doesn't care about management, or management doesn't care about the work force, or that corporate is out of touch and offers no practical help are torn down" when employees at all levels are given enhanced roles in environmental management. A third organization reported that heightened responsibility at the facility level made the facility less dependent on the corporate environmental office.

Improved Procedures and Documentation

Five participants reported that the EMS had led to improved procedures and documentation. This reported benefit is interesting in light of the fact that it is common for organizations considering EMS to complain about the level of documentation that is required in ISO 14001. One explanation for this seeming discrepancy is that organizations see a value in documentation and written procedures, but they do not want a standard to require what should or should not be documented.

Enhanced Regulatory Compliance

Several organizations reported that they had not yet been able to determine if EMS implementation had actually improved their compliance management; however, most believed that having an established EMS would do so in the future. Those organizations which began the project with well-developed systems (primarily the larger organizations) reported that their EMS had undoubtedly enhanced their ability to maintain regulatory compliance (three organizations reported this). As one large organization summarized: "Our EMS provides the process whereby environmental laws and regulations are analyzed, guidance is provided, practices are implemented, and performance is audited. The reports from the audit feed our continuous improvement cycle." The three organizations which reported these benefits had realized many of them before participating in the project; thus, the benefits may be more likely a result of having an EMS in place than a result of implementing one.

Improved Environmental Performance

The ISO 14001 Standard defines environmental performance as "measurable results of the environmental management system, related to an organization's control of its environmental aspects, based on its environmental policy, objectives and targets." Although this definition was developed through a broad consensus process, there is still no universally shared definition of environmental performance. However, it is probable that most people generally view environmental performance in terms of an organization's ability to maintain compliance and/or reduce emissions, effluents, and other causes of detrimental environmental impact. It should be noted that project participants were not asked to consider any particular definition of environmental performance in reporting how their EMS influenced environmental performance.

Five organizations reported that they had realized improved environmental performance due, at least in part, to implementing their EMS or having one already established (several others, particularly those in the earlier stages of implementation, believed that an EMS would lead to improved performance in the future). Examples from different organizations are provided below.

- Fifty percent reduction in the quantity of hazardous waste generated over a five year period (this benefit was realized before the demonstration project).
- Improved emergency preparedness and response procedures (this occurred during the project).
- Identification and implementation of two specific pollution prevention projects involving materials substitution (this occurred during the project).

Reduced Environmental Management Costs

Most organizations reported that it was very difficult to determine if the EMS was responsible for a net reduction in overall environmental management costs (it is likely that an organization's EMS would need to be in place for a significant amount of time before the organization could measure costs-savings). However, a few participants did cite specific cost reductions in a particular area due to EMS activities. For example, one organization reported a 74% reduction in hazardous waste disposal costs over the period of the project.

Access to International Markets

At the end of the Demonstration Project, participants reported that the EMS had not yet opened or maintained an opportunity in international markets. This finding is consistent with the fact that market forces for international EMS registration have not yet developed. One organization said that it was actually skeptical of the trade benefits of ISO 14001. This organization had

originally implemented ISO 9000 primarily for trade reasons, but ISO 9000 registration had not resulted in the competitive advantage that the organization originally anticipated.

Costs of Implementation

The major cost of implementing an EMS is staff time. If an organization chooses to have an outside consultant perform a large portion of the work, consulting fees might also be significant. Other costs might include travel (if, for example, corporate staff are actively involved with an off-site facility that is developing an EMS), EMS auditor training, and computer software. Additional costs might be incurred if an organization decides to pursue EMS registration or have a baseline assessment conducted.

Fewer than half of the participants specifically tracked the costs of EMS implementation, and only two (both large companies) actually reported estimated costs. Several organizations noted that they did not track the costs of EMS implementation because it was not established as a cost center -- it was simply considered a part of doing business. Those that did track costs included different items in their cost calculations. For example, some organizations only tracked consulting fees and training, while others only tracked staff time.

One participant reported estimated EMS implementation costs in some detail. Costs were estimated for 12 facilities from the beginning of implementation (spring 1995) through initial registration (around the spring of 1997). Since the estimate only pertains to EMS implementation, it does not include the future costs of EMS maintenance or registration surveillance audits. Table VI below shows categories used by this organization in estimating costs. It is important to note this is only one example from the 18 organizations participating in the project, and should not be interpreted as a "typical" case.

Table VI
One Company's Estimation of EMS Implementation Costs

	Personnel Costs	Personnel Costs	Travel	Materials	Registration
	Individual managers	Cross Functional Mgmt. Team			
Corporate Costs	\$95,000 includes salary and overhead	NA	\$75,000 5 annual site visits per facility, one person for 2-3 days	\$5,000 includes handbooks, training, supplies, etc.	NA
Costs per Facility	\$17,000 includes salary and overhead	\$25,000 includes salary and overhead	\$5,000 includes seminars and auditor training	\$2,500 includes handbooks, training supplies, etc.	\$25,000 based on costs of ISO 9002 registration
Total Costs: Corporate + 12 facilities	\$299,000	\$300,000	\$135,000	\$35,000	\$300,000

Total: \$1,069,000 corporate-wide, or \$89,000 average per facility

Barriers and Keys to Successful Implementation

Even with the commitment of upper management, implementing an EMS can be a challenging effort, particularly for organizations that have few ISO 14001 elements in place or are unfamiliar with management system concepts.

Project participants cited several barriers to implementation. By far the most commonly cited barrier was lack of time due to competing priorities (nine organizations reported this); as will be discussed later, lack of time tends to be a greater concern for SMEs. Other barriers cited include:

- insufficient support or lack of understanding from top management;
- insufficient resources;
- uncertainty about the intent of ISO 14001; and
- an aversion to added documentation and paperwork (a few organizations reported that it was difficult to convince the organization to add procedures and documentation to a system already perceived as quite successful in maintaining compliance).

A few central themes on keys to overcoming implementation barriers emerged during the group meetings and in participants' responses at the conclusion of the project. They are discussed below.

Secure Top Management Commitment Early in the Process

Without top management commitment, the resources and support necessary for EMS implementation is much more difficult to obtain. Although some participants had obtained a strong commitment from upper management before participating in the project, others struggled to obtain the necessary support throughout the project.

Gain a Thorough Understanding of ISO 14001

Several participants reported that they came to truly understand the intent of ISO 14001 only after several months of study, discussions with co-workers and colleagues, and attempts to implement some of its requirements. One participant reported that it was more stringent on its final self-assessment than on its initial self-assessment because it had developed a better understanding of the Standard over the course of the project. Based on the self-assessment results of the individual organizations (three showed no progress, or negative progress, over the course of the project), it is likely that other participants had similar experiences.

Perform a Thorough Self-Assessment

A thorough self-assessment of the existing EMS is necessary to provide direction for implementation. Many participants found it helpful to use a consultant or other external assistance in performing the assessment, or in reviewing the protocol and results of the assessment. As evidenced by the results of the independent assessments, this external objective review can be important to obtain a more neutral view of the organization's existing EMS and to provide an additional interpretation of the EMS standard.

Involve Many Functions and Staff Levels in the Planning Process

Several participants reported that one of the keys to successful EMS implementation was involving representatives from different parts of the organization. This cross-functional involvement not only brought different expertise together, it also facilitated consensus and acceptance from the organization as a whole. Many participants (both small and large) formed teams that included employees from manufacturing, marketing, the ISO 9000 program, and other functions. Several participants found it very helpful to include employees from the shop floor because of their intimate knowledge of processes and environmental aspects. Most teams in

organizations with multiple facilities were comprised of both facility and corporate employees.

Initially, Set a Small Number of Achievable Environmental Objectives

Some participants reported that setting a limited number of objectives initially helped them overcome considerable resistance to EMS implementation. One organization, for example, decided to set and achieve a few simple but meaningful pollution prevention objectives *before* developing most of its EMS documentation. This approach was intended to avert the possibility of employees being discouraged by the need to write numerous procedures (it was also intended to convince management that providing resources for the development of procedures was worthwhile). The organization reported that setting and accomplishing the pollution prevention objectives brought a great deal of satisfaction to the employees involved.

Build on Existing Business Practices

One approach to overcoming resistance to change is building on successful ways of doing business. For example, one participant noted that although there was fairly limited environmental awareness in the organization, there was widespread understanding and acceptance of basic TQM principles. After failing at first to promote the EMS concept in its entirety, the organization chose to introduce a few environmental objectives -- "disguised" as quality objectives -- through the TQM system. Once these objectives were accepted in the organization, it became easier to ask employees to write plans and procedures to address them.

Links with ISO 9000 and Health & Safety

As previously mentioned, most project participants have facilities that are either registered to ISO 9000 (ISO 9001 or 9002) or working towards registration. Only two participants reported that they were neither registered nor pursuing ISO 9000 registration. Generally, those organizations which came into the project with ISO 9000 experience had an easier time convincing others internally of the value of an EMS. Having the ISO 9000 system established or under development meant that the organization was familiar with the concept and benefits of management systems.

Some participants cited specific ISO 14001 elements that had been (or would be) modeled after analogous elements in the ISO 9000 system. They anticipated that modeling certain ISO 14001 elements after existing ISO 9000 elements would produce significant cost-savings for EMS implementation. A collective list of those ISO 14001 elements is provided below:

- *Training, awareness and competence*
- *EMS documentation*

- *Document control*
- *Operational control*
- *Monitoring and measurement*
- *Nonconformance and corrective and preventive action*
- *Records*
- *EMS audit*
- *Management Review*

Seven participants reported that they would integrate at least some elements of ISO 9000 and ISO 14001; however, at the end of the project only a few reported that they intended to create one fully integrated quality and environmental management system in the near future. One barrier to integrating the systems is that the individuals responsible for ISO 9000 within many organizations are often not knowledgeable of environmental management, and in turn, environmental managers often lack an understanding of quality management. Because of this, several organizations reported that it took considerable time to establish links between the environmental and quality programs.

There can be other constraints to system integration as well. For example, one organization, after carefully exploring its options about ISO 9000/14001 integration, decided not to combine the two systems because of a concern that (1) integrating incomplete EMS requirements into the ISO 9000 system could jeopardize their ISO 9000 registration; and (2) many procedures under the existing 9000 system were not appropriate for environmental issues. The observation made during the independent assessments regarding the separation of the environmental management staff from the ISO 9000 staff confirms that significant barriers exist to integrating the two systems.

Regarding health & safety, six participants reported that they intended to integrate ISO 14001 with their health & safety program. This is a logical step for those participants that came into the project with their environmental, health and safety programs already integrated. One organization plans to fully integrate its ISO 9000, ISO 14001, and health & safety systems in the long term.

Comparison of SMEs and Large Organizations

As Table I depicts, the 18 organizations that participated in the EMS Demonstration Project were categorized as small, medium, or large entities. The participating organizations include four small, four medium-sized, and ten large organizations. Categorization was based solely on the number of individuals employed by the organizations. An organization with fewer than 250 employees was categorized as "small"; an organization employing between 250 and 1000 individuals was categorized as "medium-sized"; and an organization with more than 1000 employees was categorized as "large". The number of individuals employed by the organization as a whole was considered (not just the number of employees in a particular facility). No attempt

was made to consider Standard Industrial Classification (SIC Code) or revenue in categorizing project participants.

Some of the differences between Small and Medium-Sized Enterprises (SMEs) and large organizations are analyzed below. Differences discussed included: motivation to implement an EMS, barriers, and potential SME advantages. Information from eight SMEs and eight large organizations was considered. (Note: this section on SMEs draws on a slightly different data set than other parts of Section V. It includes information from two additional organizations that were not included in the analysis done for the other sections).

Incentives for Implementing an EMS

SMEs and large organizations cited certain incentives in fairly equal proportions. For example, four large organizations and four SMEs stated that a desire to gain a competitive advantage was an incentive for implementing an EMS. Likewise, a desire to achieve EMS registration and gain regulatory flexibility were cited as incentives by equal numbers of SMEs and large organizations.

Other incentives, however, were not cited by SMEs and large organizations in equal proportions. Of the eight SMEs, four reported a desire to achieve more cost-effective or enhanced compliance as an incentive for implementing an EMS, and three SMEs stated that a need for better documentation and procedures was an incentive. None of the large organizations stated that "enhanced compliance" or a "need for better documentation" were incentives. In addition, four large organizations -- but only one SME -- reported that improved environmental performance or the desire to benefit from pollution prevention opportunities were incentives. These findings suggest that SMEs may be more motivated to implement an EMS because they want to enhance their compliance management and improve their documentation, while larger organizations may be more satisfied with their compliance efforts and documentation and are ready to focus on pollution prevention.

Barriers

Ten participants reported that a lack of time (due to workload and production priorities) was one of the greatest barriers to implementing an EMS; seven of the eight SMEs reported this, while only three of the eight large organizations did. Moreover, four organizations (all SMEs) found that a lack of resources, including funding, was a significant barrier, and two SMEs reported that the allocation of human resources was a significant challenge. In addition to the time and resource barriers, the SMEs reported several of the challenges that were also mentioned by the large organizations (e.g. interpreting the ISO 14001 Standard; achieving detailed documentation; promoting EMS concepts to management and employees; and training employees). This suggests that SMEs and large organizations share many of the same challenges in implementing an EMS, but that SMEs are more challenged by a lack of time and resources.

One large organization in the project found that it took the organization a great deal of time to understand the Standard before it was willing to invest time in EMS implementation. This participant stated, "Our organization dealt with this barrier in a manner which, unfortunately, smaller organizations cannot do without hiring outside consultants." In this case, the corporate staff invested time in understanding the Standard, and then disseminated guidance tools and information to personnel at the facility.

Potential SME Advantages

Some project participants also found that an SME can have certain advantages over a large organization in implementing an EMS. For example, an SME may be able to develop an EMS that is less complex than one that might be appropriate for a large organization. In addition, employees in SMEs often "wear many hats;" i.e., they have multiple functional responsibilities. In an SME with ISO 9000 experience, for example, the individual responsible for the quality system may also be responsible for implementing ISO 14001. In a large organization, however, the employees responsible for the quality system are more likely to be separate from the environmental staff.

Certain requirements in ISO 14001 might be easier to implement in an SME than in a large organization. For example, two SMEs noted that the *Structure and responsibility* requirements in ISO 14001 are simpler to achieve in an SMEs than in a large organization, since an SME typically has a less complex hierarchy. Other parts of an EMS that may be simpler for an SME include training and internal communication.

Recommended Guidance and Implementation Tools

Based on the experience of the Demonstration Project, it has become evident that certain types of guidance are very important for organizations of all types and sizes attempting to implement ISO 14001. These include:

- clarification of the intent of the ISO 14001 Standard;
- a checklist or other tool to conduct an EMS self-assessment;
- guidance on how to identify and assess the significance of environmental aspects and impacts;
- a step-by-step implementation guide;
- examples of EMS manuals, policies, and procedures; and
- EMS implementation case studies.

These are each discussed below.

Clarification of the intent of ISO 14001

The most commonly asked questions from project participants revolved around the intent of the ISO 14001 Standard. They want to know what the authors intended in the language of the Standard, and how registrars will interpret it. Although interpretation of the Standard is necessary for organizations to move forward with implementation (and particularly registration), creating a single authoritative interpretation of the Standard may be problematic. SubTAG 1 of the U.S. Technical Advisory Group has established a formal process to respond to questions submitted by interested parties about the interpretation of the ISO 14001 Standard. SubTAG 1 intends to issue answers to questions based on the SubTAG's consensus interpretation of the Standard. A list of interpretation concerns submitted by project participants is provided in the next section of the report.

A good way to understand the intent of ISO 14001 is to read EMS implementation guidance documents, such as ISO 14004 ("Environmental management systems -- General guidelines on principles, systems and supporting techniques"). Another useful document is the guidance for small and medium-sized organizations developed by NSF International, which is discussed below.

A Checklist or Other Tool to Conduct an EMS Self-Assessment

One of the first steps for an organization considering implementation of ISO 14001 is to conduct an initial assessment of its current environmental management practices. Prior to the EMS Demonstration Project, NSF International developed a user-friendly checklist to help organizations compare their existing environmental management practices to the requirements of ISO 14001. Participants used the checklist in the Demonstration Project, and NSF received positive feedback on its use. Other organizations, including the Global Environmental Management Initiative, have also developed ISO 14001 assessment tools.

Guidance on How to Identify and Assess the Significance of Environmental Aspects and Impacts

ISO 14001 encourages organizations to move "beyond compliance" through continual improvement and pollution prevention by identifying environmental impacts and setting objectives to address them. In the past, many organizations conducted environmental planning solely in response to regulatory requirements, or addressed environmental problems on an "ad hoc" basis. Thus, systematic identification and prioritization of environmental aspects (and resulting impacts), including those not regulated, is a new process for many organizations. NSF's implementation guide provides broad guidance on environmental aspects and impacts, but more detailed guidance for organizations appears to be needed.

A Step-by-Step Implementation Guide

Many organizations, particularly those that do not have much experience with EMS, need to seek outside expertise to help with the planning process and implementation. However, for smaller organizations, which may not have a corporate environmental staff, this assistance is often unavailable internally and too expensive to secure from a consultant. Through an EPA grant, NSF has developed "*Environmental Management Systems: An Implementation Guide for Small and Medium-Sized Organizations*" that provides step-by-step implementation assistance and sample worksheets and procedures (although the Guide is directed toward SMEs, it is just as useful for larger organizations). The NSF document, along with other implementation guides that are either available now or will be soon, will hopefully help to satisfy the need for cost-effective step-by-step implementation guidance.

Examples of EMS Manuals, Policies, and Procedures

Most project participants requested examples of EMS manuals, policies, and procedures. Commonly requested items included: environmental policies, procedures for identifying aspects and impacts, monitoring and measurement procedures, auditing procedures, etc. An EMS manual, although not explicitly required by ISO 14001, can be a useful tool because it provides a concise overview of the system.

EMS Implementation Case Studies

Organizations considering the implementation of ISO 14001 can benefit from learning why other organizations implemented an EMS, as well as their experiences with implementation. As more organizations implement and become registered to ISO 14001, many case studies should become available. However, at present relatively few organizations have attempted to implement ISO 14001, and thus the experiences of these few organizations are particularly valuable. This report contains self-written case studies from 17 of the 18 organizations that participated in the Demonstration Project. CEEM, Inc. has also published a collection of EMS case studies.

Participant Feedback on ISO 14001

According to ISO rules, each ISO standard must be updated every five years. Over the next few years ISO 14001 is likely to be read or implemented by thousands of organizations who will be able to offer feedback on the Standard. Since the EMS Demonstration Project presents an early opportunity for this process, each participant was asked to provide feedback on ISO 14001.

Project participants generally found ISO 14001 to be a sound model for environmental management. However, most participants expressed at least some overriding concerns about the

Standard as a whole and/or concerns about specific requirements. The most commonly cited concern was the potential for auditors to interpret the Standard differently (note: this may be viewed as a registration concern rather than a concern about the Standard). Other commonly reported concerns included confusion over the definition of "environmental aspects;" an overemphasis on documentation; and confusion about whether written procedures are necessary for particular requirements. Additional comments that were submitted regarding specific requirements are shown in Table VII.

Table VII
Specific Comments on the ISO 14001 Standard

Section	Language	Comments
4.2 Environmental policy	"appropriate to the nature, scale, and environmental impacts"	A few participants said this requirement is too subjective, and it is not auditable.
4.2	"provides the framework for setting and reviewing environmental objectives and targets"	A few participants said the meaning of this requirement is not clear.
4.3.1 Environmental aspects	"identify the environmental aspects of its activities, products or services...in order to determine...significant impacts on the environment"	Several participants expressed concerns about the definition of "aspects" and about how to determine "significance." The question was raised why the term "aspects" was needed in addition to "impacts".
4.3.2 Legal and other requirements	"establish and maintain a procedure to identify and have access to legal and other requirements..."	One organization felt this was a difficult requirement to interpret.
4.3.3 Objectives and targets	"consider...the views of interested parties"	One participant said this requirement is too subjective, and it is not auditable.
4.3.4 Environmental management program	"designation of responsibility for achieving objectives and targets at each relevant function and level of the organization"	Two organizations said that they wanted further guidance in the Standard on how deep into the organization this should go.
4.3.4	"programme(s) shall be amended where relevant"	One participant felt that more detail is needed to explain under what circumstances changes should be made.
4.4.1 Structure and responsibility	"Roles, responsibility and authorities shall be defined, documented and communicated"	Two organizations said they wanted further guidance in the Standard on how many and what type of employees should be covered by this requirement.

Section	Language	Comments
4.4.2 Training, awareness and competence	"The organization...shall require that all personnel whose work may create a significant impact on the environment, have received appropriate training"	One organization said that it is very difficult to directly tie environmental impacts to specific employees.
4.4.2	"Personnel...shall be competent"	One organization said this requirement was too subjective.
4.4.3 Communication	"the organization shall establish and maintain procedures for internal communication"	One organization said that more guidance was needed in the Standard on the meaning of "internal communication."
4.4.3	"The organization shall consider processes for external communication...and record its decision"	One organization said that there was no value added for the organization to record its decision.
4.4.4 EMS documentation	"The organization shall...describe the core elements of the management system...[and] provide direction to related documentation"	Two organizations commented that this requirement was mostly useful for an auditor.
4.4.5 Document control	"obsolete documents are promptly removed from all points of issue and points of use" and "any obsolete documents retained for legal and/or knowledge...are suitably identified"	One organization said that the requirement that documents be removed from "all" points of issue and use was too stringent; the organization also felt that the requirement that obsolete documents be "suitably identified" was not enforceable.
4.4.6 Operational control	Entire element	One organization commented that operational control in ISO 14001 is much less specific than it is in ISO 9000, and thus could potentially be a difficult requirement to implement.
4.5.1 Monitoring and measurement	"The organization shall...periodically [evaluate] compliance with relevant environmental legislation and regulations"	One organization expressed the concern that this requirement could potentially cause legal difficulties if EMS auditors were to identify non-compliance with regulations.
4.5.2 Nonconformance and corrective and preventive action	"action taken to eliminate the causes of...nonconformance shall be appropriate to the magnitude of problems and commensurate with the environmental impact encountered"	The same organization as above commented that this requirement is unnecessary because few organizations would take action that was either inappropriate to the magnitude of problems or not commensurate with the environmental impact encountered.

Participant Advice to Regulators

Thirteen of the participating organizations provided advice for regulators seeking to use the EMS approach in their interactions with the regulated community. The most common advice was that regulators should offer incentives -- primarily regulatory flexibility -- to companies that implement an EMS. These proposed incentives include:

- reductions in reporting;
- reductions in site inspections and audits;
- reductions in fines;
- elimination of penalties and NOVs for various environmental compliance issues; and
- fast-track permitting.

One project participant offered the following advice: "...(W)e genuinely believe that EMS implementation will improve our environmental performance. In fact, we have seen indications already that is exactly what is happening. We would invite regulators to confirm that this is so, and then, if satisfied, provide significant regulatory relief to companies with effective environmental management systems."

Two participants expressed concern about the ability of smaller organizations to afford ISO 14001 registration, and suggested that incentives such as those outlined above be made available to organizations which have a fully functional EMS but may not be registered to the Standard.

Many participants expressed concern about the voluntary disclosure of self-audits, and expressed a desire for a greater level of trust between themselves and regulators regarding this issue. Several participants indicated that there is a fear of being punished for "doing the right thing" in self-reporting of violations and nonconformances.

One participant noted the similarities between ISO 14001 and the "Due Diligence" criteria contained in EPA's final policy on auditing and self-policing -- *Incentives for Self-Policing: Discovery, Disclosure, Correction and Prevention of Violations*, Jan. 22, 1996 -- and expressed concern about the possibility of this policy becoming a regulation. The participant noted that there are benefits resulting from reliable guidance for civil penalty mitigation, but there is a concern that EMS elements, even if not in a specific EMS standard, will become regulation.

Three participants suggested that regulators provide expertise and assistance to organizations seeking to implement an EMS. It was suggested that regulators should place more stress on the value of an EMS to recipients of NOVs and penalties.

VI. CONCLUSIONS

Major Lessons Learned

Implementing ISO 14001 is Feasible in a Wide Variety of Organizations

The experience of the Demonstration Project suggests that an EMS based on ISO 14001 can be implemented in a wide variety of organizations, but varying amounts of guidance and assistance are required for different organizations. The main factors that seem to determine an organization's ability to implement an EMS are (1) its experience with EMS, ISO 9000, or other management system concepts; (2) the level of commitment from its top management; and (3) the resources available to the organization to develop the necessary procedures and documentation.

Whereas some organizations might be able to implement most ISO 14001 elements in a short time-frame (e.g., one year) with limited outside guidance, others might require much more time and a substantial level of guidance. SMEs, in particular, will likely require more guidance and take longer to complete EMS implementation than large organizations. All project participants found that a significant level of effort was required, regardless of how fast implementation occurred or how much outside guidance was used.

Although notable progress on EMS implementation was made over the course of the Demonstration Project, it is not clear how many participants will eventually become registered to ISO 14001 or attempt to implement further elements of the Standard following the project. Since it will likely take some participants two or more years to implement ISO 14001, follow-up on these organizations would be needed to determine the time and effort that was ultimately required.

Since the organizations in the project participated voluntarily, they might be inclined to be more successful with EMS implementation than an average sample of U.S. organizations. However, the wide variety of organizations in the project, and the significant differences among them in their abilities to make progress on EMS implementation, provide confidence that the findings from the project reflect what would be the experience of a large cross-section of U.S. organizations that might attempt to implement ISO 14001.

EMS Implementation Can Bring Concrete Internal Benefits

Project participants reported many benefits from EMS implementation that were not market- or trade-related, including enhanced environmental awareness, improved documentation, and pollution prevention. These benefits were realized within the one year time-frame of the project, and before any of the organizations had attained registration or complete implementation. This

suggests that there are many reasons other than the market and trade benefits of registration to implement the ISO 14001 Standard.

Independent Assessments Can Provide an Important Check on Self-Assessments

The results of the independent EMS assessments suggest that organizations might have the tendency to evaluate their systems higher than would independent auditors. This may be particularly true for *Objectives and targets* and the *Environmental management program*.

The findings from the independent assessments may also have important implications for the concept of "self-declaration," in which an organization would declare itself to be in conformance with the ISO 14001 Standard rather than receive an independent audit from a registrar. The distinction between self-declaration and registration does become smaller if the self-declaration is based on an objective audit from a consultant; however, consultants are not required by accreditation bodies to maintain objectivity in audits or to have specified qualifications for conducting EMS audits.

Remaining Questions and Areas for Future Study

What are the Long Term Benefits and Costs of an ISO 14001 EMS?

The Demonstration Project focused primarily on the process of developing an EMS, not on the benefits and costs of maintaining one. In the future, studies could be conducted which attempt to measure and quantify the benefits and costs of maintaining an EMS over time in a variety of organizations.

Will Implementing ISO 14001 Improve Environmental Performance?

A question frequently asked is whether implementing and maintaining an ISO 14001 EMS will improve an organization's overall compliance and environmental performance. The answer to this question may become increasingly important if regulators seek to use ISO 14001 as a tool to complement regulatory programs. Although it was not within the scope of this project to measure environmental performance, the project provided an opportunity to make several observations about the relationship between environmental performance and organizations' motivations for implementing ISO 14001. The brief discussion below is intended to raise questions about this relationship that might be addressed through future studies.

The extent to which an ISO 14001 EMS will improve an organization's environmental performance may depend primarily on upper management's commitment to improving

compliance and performance. It is difficult to argue that a fully implemented EMS will not improve the performance of an organization struggling to maintain compliance. However, if the organization lacks upper management commitment to improve, it is unlikely to develop an EMS in the first place unless it is mandated to do so through contract or market requirements.

Similarly, if the upper management of an organization having a solid compliance record is not interested in going beyond compliance, it is unlikely that the organization will implement ISO 14001 solely because it wants to motivate itself to move in that direction; in this case, the organization would be more likely to implement the Standard in order to position itself strongly in the marketplace.

Even if an organization's motivation for implementing and maintaining an EMS is market-driven and not performance-driven, it's certainly possible that the EMS, once in place, could lead an organization to recognize the environmental and economic benefits of pollution prevention and other proactive activities. If this were to occur, the organization might begin to set and meet environmental objectives and targets that go beyond compliance. Thus, an organization might not be initially motivated to implement ISO 14001 because of a desire to improve performance, but the EMS could lead to improved performance once established in the organization.

The nature of the relationship between EMS implementation and environmental performance cannot be known until a substantial number of organizations of different types and sizes implement the ISO 14001 Standard. In the future, studies could be performed examining the relationship between management systems, management attitudes, and particular performance parameters.

VII. CASE STUDIES

Participants in the EMS Demonstration Project were asked to write case studies of their own experiences with the project and EMS implementation. The case studies are important because they convey how the individual organizations view EMS and ISO 14000; they also constitute the only part of the report in which information associated with specific companies is presented. All participants submitted case studies for inclusion in this report, with the exception of Prime Tanning Company.

All but two of the case studies were written by the organizations and edited by NSF International (the case studies for Hach Company and Milan Screw Products, which were adapted from NSF's EMS implementation guide for small and medium-sized organizations, were written by NSF). The primary purpose of the editing process was to create a uniform format for the case studies. Although the case study formats are not identical, most contain the following sections: Background, Drivers for Implementing an EMS, Self-Assessment, Implementation, Benefits, Challenges, and Final Thoughts.

Notes on the Case Studies

- Several case studies refer to NSF 110, an interim EMS standard developed by NSF International prior to the development of ISO 14001. As discussed in Section IV, both NSF 110 and the ISO 14001 draft were used in the initial self-assessments.
- The terms "registration" and "certification" are used interchangeably in the case studies. Essentially, the terms have the same meaning. The difference is that in the U.S., the term registration pertains to management systems (i.e., ISO 9000, QS 9000, and ISO 14001), while certification pertains to products. In other countries, certification pertains to both management systems and products.
- Some of the case studies refer to "percent of EMS requirements in place," or "percent of EMS requirements complete." Please refer to Section IV for an explanation of how this type of information was generated through the self-assessments.

3M Corporation

Background

3M, based in St. Paul, Minnesota, is a \$14 billion, multinational firm with over 50,000 products. These products are manufactured by over 40 business units operating in more than 300 locations. Globally, 3M has 69,000 employees and operations in more than 60 countries.

3M has long been recognized as an environmental leader that manufactures innovative, high quality products. Approximately 200 of 3M's facilities worldwide have been registered (or are in the process of being registered) to the ISO 9001 or ISO 9002 Standards.

Drivers for Implementing an EMS

More than 30 years ago, the need to address potential environmental issues at the corporate level was recognized within 3M. The company's commitment to the environment was formalized when the 3M Board of Directors adopted the Corporate Environmental Policy in February 1975. This policy, which remains unchanged today, was crafted long before most companies had developed such policies.

A highly successful waste minimization program known as Pollution Prevention Pays (3P) was launched in 1975. Today, the 3P program continues to encourage employees to find innovative ways to minimize wastes and reduce costs. The 3P program has prevented 1.4 billion pounds of pollutants from entering our environment while saving the company 750 million dollars that would otherwise have been spent on pollution control and wasted resources. 3P continues to be an internationally acclaimed model waste minimization program. The corporate environmental organization (Environmental Technologies and Services (ET&S)) has initiated numerous additional environmental programs for managing other specific environmental aspects (e.g., underground tanks, asbestos, air emissions, etc.) on a global basis. These efforts have substantially reduced wastes and emissions and move 3M towards sustainable development. 3M's corporate ET&S staff viewed the EMS Demonstration Project as an opportunity to gain experience in formalizing an environmental management system (EMS) at a 3M facility and to increase 3M's institutional knowledge of EMS reviews.

The 3M Dental Products facility in Irvine, California volunteered to be the pilot site for the EMS Demonstration Project. The Irvine site's interest in pursuing ISO 14001 is a natural outcome of their business and environmental culture. Irvine has the strong management support essential for an EMS to be successful. The site, which employs 240 people, manufactures and markets over 700 products used in dental offices and orthodontic laboratories worldwide. The Irvine facility was the first 3M facility to obtain ISO 9001 registration. The site also has been working through the Malcolm Baldrige Award process at the state and national levels. Due to the nature of its products, the 3M Dental Division also has significant involvement with the US Food and Drug Administration.

The Irvine operation's primary customers are dentists. The division has significant export markets beyond North America (including the European Union, Pacific Rim, South America, and

Africa). Products manufactured include dental restoratives (such as aesthetic filling materials for teeth), dental adhesives, caps, and impressing materials used in making bridges and crowns.

Self-Assessment

The initial EMS review was conducted in May 1995. The NSF self-assessment tool was used to conduct an evaluation of the site's existing EMS versus the requirements of ISO 14001. Potential ISO 14001 linkages with existing ISO 9000 requirements were identified, and the development of an implementation guide for use by other 3M locations was initiated.

The review team consisted of three 3M ET&S staff members (the Quality Manager, Auditing Supervisor, and a Senior Environmental Auditor), a 3M Corporate ISO 9000 Quality Manager, and an independent environmental consultant familiar with the NSF and ISO environmental management standards. Three preliminary site contacts (the Environmental Engineer, Safety, Health and Environmental Manager, and ISO 9000 Quality Manager) were heavily involved in the initial assessment.

Implementation

Independent of the development of ISO 14001 and the EMS Demonstration Project, 3M had been moving towards more formal documentation of its EMS. In 1994, a formal EMS was initiated for 3M's international locations and discussions were initiated for implementing this process on a global basis. The 3M vision and mission statement are as follows:

Vision: "3M practices sustainable development by continuously improving the environmental performance of our products and processes."

Mission: "The EMS will ensure compliance to global regulations and 3M policies and will facilitate continuous improvement of environmental performance."

Once the initial self-assessment was completed (including a written report assessing observed gaps), internal division resources were used to review the identified gaps, define an implementation plan, and close each gap. A Gant chart was used to ensure that the implementation plan described a logical sequence of events (for example, you cannot conduct an EMS audit until you have identified and defined all of the EMS elements and have trained auditors).

Although follow-up efforts were primarily the responsibility of the Irvine site, the facility also utilized division-level resources. For example, a division representative trained in ISO 9000 auditing had significant involvement in the development of the EMS documents. A team consisting of two site employees and one division employee spent six and one-half months preparing EMS documentation. Since there are major similarities between ISO 9000 and ISO

14001, eight of the 22 documented EMS procedures came directly from Irvine's ISO 9001 Quality Manual. These procedures were in the areas of:

- training, awareness, and competence
- management system documentation
- document control
- monitoring and measurement (calibration of equipment for both process and test)
- nonconformance (corrective and preventive action/root cause analysis and closure)
- records (identification and retention)
- management system auditing (internal and external)
- management review

In addition to writing a site-specific Environmental Management Systems Policy Manual, a total of 22 Standard Operating Procedures (SOPs) were written to address all areas of ISO 14001.

The ISO 14001 certification audit occurred in June 1996, and the facility received its certification to the ISO 14001 DIS in July 1996. The registrar used for the ISO 14001 audit was also used by the Irvine site for its ISO 9001 registration.

Challenges

The biggest obstacle encountered was in interpreting the ISO 14001 Standard. While the Standard describes what should be included in an EMS, it leaves the level of detail and level of documentation open to interpretation. Through substantial literature review and numerous discussions with peers, consultants and potential registrars (as well as internal discussions), an agreement was reached on 3M interpretations that define our "Practice in Place" for each element of the ISO 14001 Standard.

Although the site has not seen a reduction in overall environmental costs as a result of the EMS, neither has it seen an increase in environmental costs. Current estimates are that development and implementation of the EMS for the Irvine site required approximately 1,200 person-hours, covering both facility and division personnel. Much of the effort was spent in interpreting and understanding the Standard and designing the Environmental Policy Manual. This estimate includes the time required for SOP documentation and additional EMS training for facility personnel. Overall costs to develop an EMS implementation strategy and corporate guidance have not been defined.

Benefits

Implementing this EMS model brings a more systematic approach to managing overall environmental compliance. The EMS also leads to more direct ownership of environmental compliance issues by facility operations and potentially reduces reliance on corporate staff. Through the process of continuous improvement, more focused resource utilization, and issues management concepts (which are inherent in the ISO 14001 process), further environmental improvements will occur. Ultimately, this process is a necessary element of 3M's sustainable development efforts to develop products that meet customer needs and respect the ability of future generations to meet their own needs.

Allergan, Inc.

Background

Allergan, Inc. is a pharmaceutical manufacturer of eye care and skin care products. The company's headquarters is located in Irvine, California and maintains operations worldwide. The Allergan facility in Waco, Texas was selected to participate in the EMS Demonstration Project.

Drivers for Implementing an EMS

Allergan is pursuing the development of a formal EMS and independent certification under various worldwide standards for a variety of reasons. These are listed below.

- A formal EMS will help the company to ensure regulatory compliance.
- A high environmental standard is already in place at Allergan.
- Allergan's competitors are preparing to implement EMS standards and intend to become certified to them.
- Development of a formal EMS might be required by certain governmental bodies if voluntary EMS efforts by industry are not effective.
- Obtaining permits and approvals from regulatory agencies and communities might be streamlined if a facility has ISO 14001 or Eco-Management and Audit Scheme (EMAS) certification.
- Regulatory audits and inspections might be reduced if a formal EMS exists.
- New drug approvals (by the US Food and Drug Administration or Ministries of Health in other countries) and other required approvals might be streamlined.
- EH&S operations at the facility level should improve over time where a formal plan and actions are in place for attaining and maintaining certification.
- Adoption of a formal EMS might provide marketing opportunities (by easing the entrance into new markets).

Self-Assessment

At the outset of the project, the Waco facility already had a well-developed and formal environmental program in place. Allergan wanted to test this program against the requirements of NSF 110 and to determine where improvements could be made. The facility had also attained ISO 9002 certification and thus had a formal quality process in operation.

NSF supplied an EMS self-assessment tool along with training and guidance on how to conduct the self-assessment and interpret its results. The site's Facility Management Team and the Corporate EH&S Team both supported the pilot assessment. Based on this assessment, some minor deficiencies in the EMS were discovered and corrective actions were subsequently implemented.

Since the Waco facility is routinely inspected by FDA and other regulatory agencies, the site was ready to be evaluated by an external third-party EMS assessor. Allergan contracted with an assessor to conduct a one-day independent assessment of the Waco facility's EMS. This follow-up assessment was conducted three months after the initial (internal) self-assessment. The independent assessor reviewed the facility's environmental manual, which covered the nine major topics in NSF 110.

Implementation

Allergan has found that one of the key challenges in implementing a formal EMS is the need to clearly demonstrate the system's positive benefits. The ability to demonstrate cost savings from pollution prevention/waste minimization activities helped to improve the credibility of Allergan's environmental program. In addition, putting environmental performance criteria into all job descriptions, performance reviews, and specific management objectives helped to maintain focus on the environmental area and supported our efforts to integrate environmental management with other business requirements.

During the course of our implementation process, we also found that learning to "speak the language" of other business functions (such as Marketing, Sales, R & D, and Production) was critical to obtaining and maintaining the support of key business managers.

Benefits

By providing a structured methodology for evaluating EH&S effects, policies, business and legal requirements, stakeholder interests, and objectives and targets at the facility level, the demonstration project proved to be very beneficial. Allergan also benefited from the development of written EMS implementation action plans.

The EMS has also helped to ensure regulatory compliance by providing a methodology for managing compliance requirements and correcting deficiencies. While the company already had a compliance process in place, the EMS made this process more formal by tying accountability and performance to individual employees. In addition, education and awareness related to the EMS have improved considerably as a result of the project.

Finally, the EMS process facilitated the institution of a formal product design process that incorporated life-cycle concepts.

Challenges

Allergan has identified several issues which might affect EMS implementation and certification. Two of these are discussed below.

- It is not clear whether an EMS certification for a facility that is part of a larger organization must "stand alone" on all EMS elements or whether some elements can be addressed by a

corporate function or another facility within the organization. One example at Allergan would be product design. Allergan's Waco facility is a manufacturing site and has very little control over product design, including product packaging. It may take several years of research and development on a product before the manufacturing facility is made aware that a new product will be manufactured at that site. If certain activities or functions are outside the control of a facility seeking registration, how will a registrar determine if EMS elements related to those activities or functions have been adequately addressed?

- The threshold criteria for certification are not clear at this time. Could a facility achieve certification if all elements of the EMS standard have not been fully addressed? Guidance is needed to allow companies to make internal judgments as to whether or not a facility is ready for certification.

Final Thoughts

In retrospect, a one-day review of the EMS by an outside assessor was not adequate to cover all EMS elements and to show evidence of achievement. Two days should be adequate for this purpose. In addition, it would be preferable to have two assessors evaluate a facility's EMS, thereby ensuring a more objective review of the system and allowing for "reality checks" between the assessors.

As of December 1996, Allergan had received EMS registration at its facility in Westport, Ireland (the facility was registered to ISO 14001 and IS 310 (the Irish national EMS standard)). Allergan had also received a recommendation for registration to ISO 14001 at its Waco, Texas facility.

Commodore Applied Technologies

Background

Commodore Applied Technologies, Inc. is a small publicly-owned company specializing in the discovery and development of new technologies for the remediation of hazardous materials. Although small in size (currently the company employs 25 staff members), Commodore can list among its achievements the only operating permit for a non-thermal PCB destruction process granted by the US Environmental Protection Agency. In addition, Commodore's Agent 313™ technology for environmental restoration and remediation was selected by the US Department of Commerce as one of ten innovative technologies for the Rapid Commercialization Initiative Program.

Drivers for Implementing an EMS

There are two primary motivations for Commodore to implement an EMS — regulatory compliance and an anticipated competitive business advantage. Commodore is required under the terms of its EPA permits to have an EMS. The company believes that an EMS designed to conform with ISO 14001 would satisfy those permit requirements in a manner that also addresses the company's other business needs. Commodore further envisions that an EMS will help the company become more effective at compliance, and expects that companies certified to ISO 14001 will be looked upon favorably by both regulators and customers. Because Commodore is an environmental business, it was desirable to lead by example in the area of EMS development.

Implementation

Small businesses face many challenges when trying to comply with state and federal regulations and when competing with larger, more established businesses. We believed that implementation of ISO 14001, while providing the benefits noted above, would be a considerable challenge for our company.

Initially, our worst fears were realized. Limited staff and other resources made it difficult to compose and review the new policies and procedures required to satisfy the ISO 14001 Standard. Those same organizational limitations left us with a system that was often no more than one layer deep. Also, due to the size of the organization, the employees implementing the procedures were also responsible for management review. Additionally, urgent business needs frequently delayed work on EMS documentation. It began to appear that a task of this magnitude might be beyond the capabilities of a small business such as ours. While the company continued to have a strong commitment to an EMS and to the creation all of the procedures and programs necessary to effectively operate an environmental business, the problem was in backing up that commitment with action.

Surprisingly, Commodore found that the ISO 14001 Standard actually was the solution to our EMS development challenge — that is, by using the ISO 14001 framework as a template for the EMS, we found that some of the system design work had already been done for us.

As a small business without a formal management system, it was found that Commodore actually might have several advantages over a large business with an established EMS, such as:

- building policies and procedures was simplified in a small organization;
- an EMS culture could be built from the beginning (rather than adding EMS onto an existing management system); and,
- policies and procedures could be written to follow the ISO 14001 format the first time, rather than rewritten at a later date.

In other words, it was not necessary to change a culture at Commodore, rather, we had to create one. Furthermore, since Commodore has an operational commitment to both ISO 14001 and ISO 9000, it was possible to build all of the system documentation to follow ISO format and ideals.

Using the concepts in ISO 14001, Commodore began to write its environmental policy and procedures. Since the environmental policy and all of the EMS procedures were new, Commodore was able to base everything on the requirements of the ISO Standard. By creating policies, procedures and other EMS documents “from scratch,” it is expected that nonconformities related to the system’s documentation and its contents can be avoided.

Final Thoughts

Commodore gained a lot of knowledge and experience from the EMS Demonstration Project. The opportunity to benchmark with other companies and to share solutions for overcoming common challenges has been a great advantage in the EMS planning stages.

As with anything new, there are questions that remain unanswered. The most significant relates to the value of ISO 14000 certification. No one can say for certain what the value of certification will be. It is hoped that certification will cause regulators to look favorably upon companies during inspections or incidents. It is also hoped that certification will prove advantageous in the marketplace. But no one really knows. Nonetheless, Commodore believes that the value is in the doing, and that having an EMS is the right thing to do.

Fluke Corporation

Background

Fluke Corporation is a global manufacturer of electronic test and measurement instruments, including multimeters, oscilloscopes and other devices. With annual sales exceeding \$400 million, Fluke sells its products in over 80 countries. The distribution of sales is 40% in the U.S., 40% in Europe, and 20% elsewhere, including Asia. Fluke's worldwide headquarters is in Everett, Washington, and the European headquarters is in Eindhoven, The Netherlands. Fluke product development divisions and manufacturing facilities are in Everett, Washington, and Almelo, The Netherlands.

Fluke is a vertically integrated company, which means that it manufactures many of its own instrument components, including printed circuit boards, semiconductors and other microelectronic components, and plastic parts. These processes are the source of large quantities of hazardous wastes, wastewater (which must be treated prior to discharge), and air emissions which must be controlled.

Drivers for Implementing an EMS

Fluke has been in the process of implementing an EMS since about 1988. The implementation began with an expansion of the environmental program to include activities which go "beyond compliance." These activities include pollution prevention, and integration of environmental responsibilities into overall business practices. Integration has been achieved by a decentralized corporate environmental staff. At the same time, environmental issues began to become recognized as "quality" issues, resulting in integration of the quality and environmental programs. This realignment has resulted in significant cost savings through more efficient use of materials, waste minimization, and other activities which directly impact profitability.

With almost two-thirds of its business outside the U.S., Fluke is very aware of the impact of international standards and directives on its processes, products, and sales. Fluke was the first company based in Washington State to achieve ISO 9001 certification, in 1993. As a result of this awareness of the international marketplace, Fluke has been gradually developing an EMS which will conform to international standards: first the British Standard BS 7750; and now ISO 14001. The primary driver for implementation of an EMS is the market itself, both in terms of product end-user (customer) expectations, and potential trade barriers.

Self-Assessment

An initial self-assessment was conducted in June 1995. This assessment indicated that Fluke's EMS conformed to approximately 55% of the draft ISO 14001 Standard. The major areas that were not in conformance with the Standard were EMS documentation, formal objective setting, and self-auditing.

Implementation

A long history of progressive environmental management at Fluke, which continues to reap bottom line benefits, indicates that the existing EMS is highly effective.

In early 1996, Fluke management made a deliberate decision to delay the full implementation of ISO 14001, and third-party certification, indefinitely. This decision was based on the fact that there is no clear indication that customers or others in the marketplace are requiring certification. Fluke is currently monitoring customer expectations and international trends in anticipation that changing trends could lead to a decision to certify to the ISO 14001 Standard.

However, Fluke's environmental strategy includes efforts to prevent or overcome environmental barriers to international trade. This strategy is resulting in continuing efforts to achieve conformity to ISO 14001. The ISO 14001 manual is in draft form. All documentation for environmental operations, hazardous waste and wastewater treatment system documents, and training records, are included in the ISO 9001 program. In addition, linkages between ISO 14001 and existing ISO 9001 documentation are being identified. Fluke's two internal ISO 9001 auditors have attended a one-day ISO 14001 training session, and the current plan is to merge the ISO 9001 and 14001 programs as much as possible. If and when the decision is made to pursue ISO 14001 certification, the auditors will receive training in EMS auditing.

Other educational activities are also ongoing, such as participation in local area ISO 14001 work groups, and subscription to various information sources. In addition, Fluke is actively involved in a local EMS leadership project, in which representatives from business, environmental agencies, and public interest groups are looking into the potential benefits of ISO 14001 as an alternative to traditional "command and control" systems. Finally, Fluke has obtained a proposal for registration services, and five year maintenance of registration. These costs are included in the EMS budget for the next two years, in anticipation of the need to become registered on relatively short notice.

In October 1996, Fluke conducted a third-party baseline audit of its EMS against the ISO 14001 Standard. This audit, which involved extensive documentation inspection and personnel interviews, provided further clarification of documentation and other requirements which must be addressed in order to demonstrate compliance with ISO 14001.

Fluke's expectation is that certification will become a business necessity in the relatively near future. Based on emerging trends, it is expected that both the U.S. and Netherlands manufacturing operations will probably receive third-party certification to ISO 14001 by the end of 1998.

Challenges

Fluke's ISO 9001 registration experience indicated that the company had "over-documented" its quality management system in anticipation of what was expected by ISO 9001 auditors. Since the original ISO 9001 certification in 1993, Fluke has been systematically simplifying its quality program documentation, while maintaining conformity with the Standard. In order to preclude such "over documentation" for ISO 14001, Fluke will conduct a comprehensive third-party pre-registration audit prior to actual application for registration.

Another challenge is to take full advantage of existing ISO 9001 processes. Since there appears to be a considerable overlap between ISO 9001 and ISO 14001, Fluke sees a definite advantage in combining these programs, including the internal audits. This will be a major new activity for the ISO 9001 auditors, who will need considerable EMS training.

Benefits

Even without the benefit of a formally documented program, Fluke has continued to set goals and make progress on various pollution prevention and resource conservation projects. These successes have been possible because Fluke has integrated its environmental policy into the corporate culture and into many of its basic business practices, and because the link between environmental issues and quality is well established. The benefits of sound environmental management are recognized and supported by top management. In addition to management support, employee team contributions are recognized through quality program rewards and other recognition programs.

Environmental managers at Fluke also recognize that having an ISO 14001 EMS can potentially cut costs, reduce wastes, and involve employees in every aspect of environmental management.

Globe Metallurgical Inc.

Background

Globe Metallurgical Inc. (Globe) is a privately-owned producer of silicon metal and specialty ferrosilicon products. Globe's products are produced in ten submerged arc furnaces at four manufacturing facilities (located in Beverly, Ohio; Selma, Alabama; Springfield, Oregon, and Niagara Falls, New York). Globe is the oldest ferroalloy company in the United States and the largest US producer of silicon metal and specialty ferroalloys. Silicon metal is marketed to the primary aluminum industry and the chemical industry, and the specialty ferroalloys are used in the foundry industry. Globe has been recognized by its customers as a quality leader, winning the first "Malcolm Baldrige Quality Award" for small business in 1988, the "Shigeo Shingo Prize for Manufacturing Excellence" in 1989, General Motor's "Targets for Excellence" award, and Ford's "Total Quality Excellence" award.

Drivers for Implementing an EMS

Globe decided to participate in the EMS Demonstration Project after receiving a survey from a key customer requesting information on our environmental management program. This same customer also requested that Globe participate in its 1995 Supply Chain Environmental Forum. Globe also has a customer that has included environmental commitment in its current Supplier Excellence Agreement. In addition, Globe sells about 25% of its specialty ferroalloys overseas and, as is the case with ISO 9000, there are indications that ISO 14001 registration could become a prerequisite for doing business overseas (especially in Europe). Globe believed that the EMS Demonstration Project would help the company establish an EMS that satisfies its own requirement for continuous improvement and will meet any future requirements of its customers or regulatory agencies.

An important consideration in Globe's decision to develop an EMS is the growth of the company, coupled with the increasingly complex environmental regulations faced in four different states. Without a well-designed EMS, Globe felt that a high probability existed that there would be an inadvertent regulatory violation or failure to meet some other obligation established by law.

Self-Assessment

At the beginning of the EMS Demonstration Project, Globe did not have a comprehensive EMS in place. The company's primary focus was on ensuring compliance with environmental regulations at the federal, state and local levels. Its EMS consisted of an environmental policy and various programs established at each of the manufacturing plants. That is, each of the four plants had implemented its own environmental policies and procedures based on state and local regulatory requirements, rather than on any specific corporate directives.

The first self-assessment (performed by site and corporate environmental managers) was based on the environmental policies and procedures in place at the four plants. This self-assessment was designed to:

- identify what was currently in place at each site; and
- assess what might be transferable from one location to the others.

The scope of the assessment included examination of records, interviews with individuals at each plant, and a comparison of the resulting data against the requirements of NSF 110. The assessment indicated that the company had partially implemented some of the elements of NSF 110, but that very few elements had been implemented completely.

The second self-assessment (performed approximately one year later) was conducted by the individuals responsible for day-to-day environmental duties at each of the four plants with the assistance of Globe's environmental consultant. The second self-assessment was based on the ISO 14001 Standard, rather than NSF 110. The basis for scoring in the second self-assessment was as follows:

- If all four plants had completed an element, that element was scored as complete for the corporation.
- If only some of the plants had successfully completed a requirement, it was scored as partially complete for the corporation.

The results of the second self-assessment showed that none of the ISO 14001 elements were considered successfully implemented, because not all of the sub-elements were rated as "evaluated and sustained". At the time of this writing (October 1996), we believe that the company is nearing completion on certain ISO 14001 elements, but the process is so dynamic that it is often difficult to declare that something is really completed.

Implementation

To continue to make progress, Globe is embarking on a four-year program to develop an EMS that will be fully integrated with its existing quality and safety management system. New procedures and programs will be developed to fully implement Globe's environmental policy by consulting with individuals on the shop floor who actually perform the work. The integrated system will reflect all of the elements of ISO 14001 in case the need for registration develops; however, Globe has no plans to seek ISO 14001 registration at the present time. It is believed that lessons learned during the ISO 9002 certification process will facilitate the establishment of an effective EMS. Some of the key lessons are that employee training and clear internal communications are critical elements in the development of a successful system. Globe anticipates that its greatest effort and actual expense will be in the area of personnel training.

All of Globe's plants have received ISO 9002 certification. Where appropriate, the ISO 14001 requirements will be incorporated into the existing management system documentation. Some

elements (such as training, documentation and management review) present obvious opportunities for ISO 9002/14001 integration. Quality, environmental, and safety issues will continue to be integrated into work instructions and training so that employees will not need to learn and maintain multiple sets of procedures. It is also possible that Globe may combine its environmental audits with quality and safety audits.

Quality, safety, and environment issues have been and will continue to be discussed at Globe's monthly Quality, Efficiency and Cost (QEC) committee meetings. The QEC committee is composed of managers from all four plants and from corporate headquarters. These meetings provide a venue for discussing issues and events, as well as for developing strategies and plans.

Challenges

For Globe, the greatest challenge in the development and implementation of an EMS has been the competition for resources and the "human engineering" that must be done to create a sense of environmental concern within an organization dedicated to production and quality at the lowest possible cost to its customers. Globe believes that the integration of management systems (as discussed above) will help to create and sustain a culture in which environmental management is an integral part of the job.

Benefits

Once the EMS is in place and effectively implemented, Globe should be able to demonstrate continuous improvement in the environmental area. As with its quality management system, the company expects some economic benefits as well. For example, it is expected that continuous environmental improvement will reduce air emissions. The 1990 Amendments to the Clean Air Act require monitoring of emission limits and payment of fees based on tons of pollutants emitted. By reducing air emissions, the company should save money by reducing waste generation and by limiting air pollution fees.

In addition, with the interest shown in environmental matters by some of its customers, Globe's expects that a comprehensive EMS could be a valuable business tool, particularly by retaining customers and market share.

Hach Company

Background

The Hach Company (Hach) is an international manufacturer and distributor of instruments and reagents for colorimetric testing, with annual sales of over \$100 million. Hach manufactures spectrophotometers, colorimeters, turbidimeters, and portable testing equipment for the water and wastewater markets. The company manufactures instruments at its headquarters in Loveland, Colorado, and has a chemical manufacturing and distribution plant in Ames, Iowa. Hach is registered to ISO 9001 and is a member of the Chemical Manufacturers Association's (CMA) Responsible Care[®] program.

Drivers for Implementing an EMS

Through the demonstration project, Hach decided to pilot EMS implementation at its Ames facility. The Ames facility has approximately 300 employees and faces environmental management challenges due to its many chemical production processes. The Ames facility is the only Hach facility that is currently participating in CMA's Responsible Care[®] program. Hach decided to implement an EMS at its Ames facility for several reasons. The company felt that a sound EMS would: 1) provide assurance to the officers, board of directors, and company stockholders that the company will continue to meet regulatory compliance requirements and is prepared to handle other environmental issues; 2) provide a framework to maintain support and resources from senior management to meet environmental objectives and targets; 3) help create market opportunities for the organization; 4) be a mechanism to gauge environmental performance; and 5) help the company to identify its responsibilities beyond compliance in order to meet the needs of stockholders, employees, neighbors, customers, vendors, and suppliers. Hach also believes that the EMS provides a mechanism to keep its staff lean and responsive to the constantly changing needs of the organization.

Self-Assessment

In order to examine the Ames facility's environmental strengths and weaknesses, the facility's Quality Director performed an initial self-assessment of the EMS. The Quality Director reviewed the NSF 110 EMS Standard and interviewed the Environmental Safety and Health (ESH) staff at length. The Quality Director determined that the facility's EMS conformed with approximately 30% of the requirements of NSF 110, which was consistent with the expectations of the ESH staff at that early stage of EMS implementation. The assessment process provided the ESH staff with a benchmark from which they could measure progress as they continued to improve the facility's EMS.

After the initial self-assessment performed by the Quality Director, the ESH staff performed an informal interim audit. The Quality Director then performed a second formal audit of the EMS (using ISO 14001) after one year of implementation. The ESH staff was pleased with the audit process because the quality management system (QMS) staff had extensive experience in

auditing management systems. The Quality Department acted as an independent party and performed a very thorough audit. The Quality Department has stressed that the ESH staff must document how they do things. There were times when an EMS element was in place but needed to be documented.

Implementation

Hach Company had previously developed an environmental policy, but developed additional policies to fulfill CMA's Responsible Care® program and the policy requirements of ISO 14001. Hach Company has issued its Corporate Environmental and Safety Policies to address continuous improvement, periodic assessments, product stewardship, regulatory compliance, operations, facilities, and employee health and safety. In addition, the President of Hach Company has issued The President's Commitment, which expresses top management's commitment to environmental stewardship and the safety of employees and customers.

In order to determine the Ames facility's environmental aspects, the ESH Department reviewed the table of contents of its new ESH manual. The table of contents helped them to develop an informal environmental effects register and a safety register. The group then evaluated how environmental regulations affect the company by examining federal requirements (e.g., Clean Water Act, Safe Drinking Water Act, Clean Air Act, etc.), as well as state and local environmental regulations. The ESH Department then explored the facility's environmental aspects and resulting impacts which are beyond those addressed by environmental regulations. A three- to four-page document was developed that focuses primarily on the facility's operations and processes and puts less emphasis on aspects such as energy use.

Development of the environmental effects register facilitated the setting of objectives and targets. While the EMS is still in development, the objectives are focused on maintaining compliance and tackling issues that had been previously unresolved. One particularly important environmental issue for the company is determining the impact of its chemical products on international customers, since 35% of the company's products are sold internationally. These product-related impacts will be given more consideration when setting objectives and targets in the future.

The ESH staff maintains access to copies of federal and state regulations, manuals, journals, on-line resources, and software packages that help them to keep abreast of all pertinent environmental regulations and statutory requirements. While the company has always been very good at maintaining regulatory compliance, the new EMS procedures for legal and other requirements have helped to make compliance activities more focused and efficient. Procedures designed to ensure compliance have been properly documented and will protect the company in the event of employee turnover. The ESH staff at the Ames facility is developing extensive written procedures to address compliance activities that are sometimes above and beyond those required by ISO 14001.

Hach believes that the structure and responsibility requirements of an EMS are simpler to achieve in a medium-sized organization than in a large one. The staff at the Ames facility has been given the autonomy to implement an EMS without extensive corporate supervision. This

has simplified the process because the lines of communication are shorter and the EMS can be focused on the operations of a single facility.

The Ames facility has an excellent training program due in part to the commitment of resources in this area. The facility has a full-time ESH training coordinator. Implementing the EMS has supported the facility's ESH training efforts by helping to define training objectives. The ESH staff is also developing procedures for all ESH training. The documented procedures will describe the goals and objectives of training and establish curricula for applicable programs.

Internal communication has improved due to EMS implementation. The ESH staff is working with members of the site's operations, design, and purchasing departments to set reasonable environmental objectives and targets that complement other business goals. Environmental issues are becoming an integral part of the business.

While the ESH staff started to develop an ESH manual in September 1995, the Ames facility is still in the process of completing its EMS documentation. The ESH manual is somewhat unique in that it must be able to accommodate the extreme diversity of the site's operations — for example, the manual must address over 6,500 chemicals used or produced at the facility.

The site's ESH staff includes two college students that are working at the facility to develop some of the documentation (such as EMS procedures) required for a successful EMS. The students have been very helpful — they ask a lot of questions and can explain the procedures clearly and without jargon. The site has also run some mock-drills or table-top exercises to assess the effectiveness of its procedures.

Because Hach is registered to ISO 9001, the ESH staff has learned valuable lessons from the QMS staff, including lessons about document control practices. As the ESH staff began implementing the EMS, they discovered that the site was not as good at controlling environmental documents as they had believed. A sound document control system is crucial to a successful EMS — without it, sooner or later someone will be working from an old version of a procedure. The document control system is managed electronically by a senior ESH staff member.

As mentioned previously, the ESH staff at the Ames facility is developing extensive written procedures to address compliance activities, including those that pertain to monitoring and measurement. These procedures will be included in the ESH manual. The ESH staff has built upon the facility's QMS corrective and preventive action procedures to facilitate development and implementation of the EMS.

The management review element of the ISO 14001 Standard has not been implemented at the Ames facility. The facility does not intend to fulfill the requirements of the management review element unless the site decides to pursue EMS registration. Hach does not believe that the management review process adds value to the EMS unless registration is being sought. Hach believes that all other elements of an EMS can be implemented without management review.

As discussed earlier, the initial self-assessment showed that the Ames facility's EMS conformed to approximately 30% of the NSF 110 EMS Standard. After six months of dedicated

implementation efforts, the site had successfully implemented approximately 58% of the Standard, and after one year of implementation it has successfully implemented approximately 71% of the Standard. During this time, the ESH staff's primary goal was to continue to ensure regulatory compliance. EMS implementation efforts were carried out whenever time permitted.

Challenges

One of the challenges that the ESH staff at the Ames facility experienced during EMS implementation was driving the EMS down through the organization and up through management. The ESH function is often viewed as a separate entity in many organizations and not as an integral part of the business. This perception was initially a barrier to EMS implementation. ESH is now viewed as a more integral part of operations.

Costs associated with EMS implementation can be difficult to quantify. To date, the most significant costs have been related to personnel expenditures and office supplies. The ESH staff at the Ames facility has estimated that if the facility had to start from scratch, EMS implementation over a two-year period would cost approximately \$20,000 - \$30,000 per year. Hach estimates that a company must be willing to commit at least one person-year to implementation of an EMS, but this will vary from company to company. Some of the costs of implementation can be hidden but must be accounted for — for example, the Ames facility spent approximately \$5,000 on supplies and printing costs for EMS implementation. Initially the costs of EMS implementation may outweigh the benefits, but in the long run, an EMS can help prevent an environmental problem and strengthen an organization's commitment to be a good corporate citizen.

Currently, there are no plans to integrate the ISO 14001-based EMS and the ISO 9001 QMS at the Ames facility. The QMS staff has suggested that operating parallel systems is the best approach for both ESH and Quality at this time. The QMS was adapted from existing procedures and possibly could be more efficient in some areas, while the EMS developers had the opportunity to "start from scratch" and develop processes and procedures that may be more effective and appropriate for ESH issues. In addition, the QMS staff are hesitant about fully integrating an "immature" EMS into the QMS as this might jeopardize the company's ISO 9001 registration. In the event that Hach chooses to pursue EMS registration, the issue of system integration will be revisited, because integration could result in synergy and cost-savings for both Quality and ESH.

Benefits

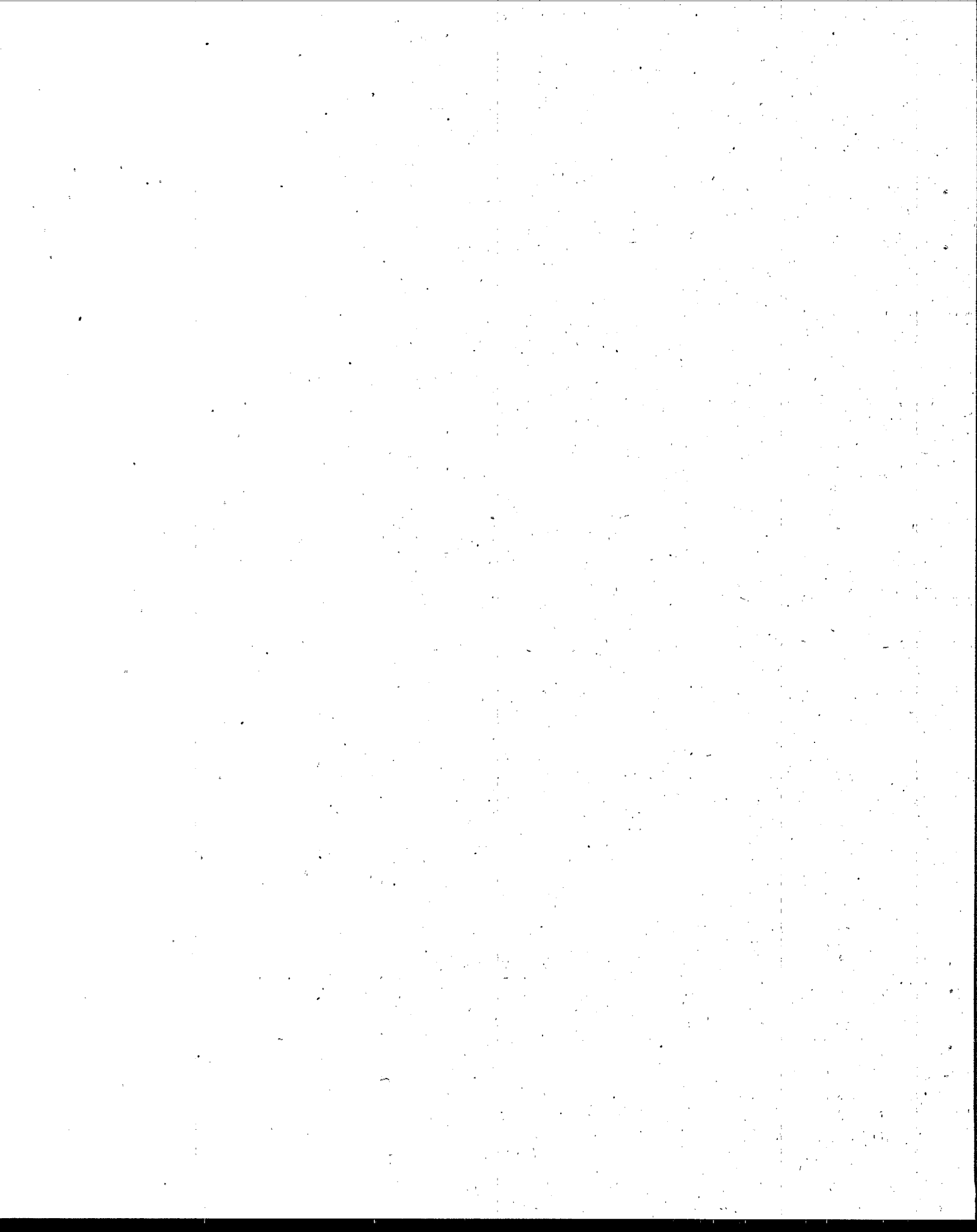
Hach believes that there are numerous potential benefits associated with implementation of an EMS (e.g., assurances to stakeholders, a framework to maintain support and resources from senior management, market opportunities, a mechanism to gauge environmental performance and to identify responsibilities beyond compliance). During the EMS implementation process, the Ames facility began to observe improvements in its environmental performance. For example, waste disposal costs have dropped 70% in one year. The EMS was a contributing factor to the cost reduction along with the company's quality focus and continuous improvement efforts.

Since the EMS has not been completely implemented and the system is relatively new, the benefits have been hard to quantify. But the company believes that the benefits are there. The EMS development process helped to spearhead a major renovation program within the facility for safety and environmental improvements. Employees have started to ask questions and are following procedures carefully. In addition, the ESH Department is gaining respect from other business units. The ESH staff will maintain a focus on compliance and is working closely with plant managers to minimize the impact of compliance requirements on production. However, the ESH staff is now in the position to discuss why the company should go beyond compliance and what the business reasons would be for doing so.

Final Thoughts

Hach has not determined if it will pursue EMS registration. The company will "wait and see" if market forces (particularly demands from international customers) and potential regulatory incentives provide sufficient benefits to offset the costs of registration. The company may not implement the remaining 20 - 25% of the ISO 14001 requirements unless the company decides to pursue EMS registration. In the event that the company decides to pursue registration, it will be relatively easy to put the remaining elements in place given sufficient notice, time and planning.

While questions remain about the value of EMS registration, Hach has come to some conclusions about EMS implementation at its Ames facility. Initially there were concerns about how the EMS would fit with the company's culture, but Hach believes that the EMS has helped to bring about a positive culture change. The EMS approach is consistent with the company's audit policies and procedures, because it fosters a systematic approach that lends itself to periodic evaluation. In addition, the process of evaluating the strengths and weaknesses of the facility's EMS has identified opportunities for improvement. Hach believes that it has benefited from assessing and improving the EMS at its Ames facility.



K.J. Quinn & Co.

Background

K.J. Quinn & Co. (Quinn) is a privately owned specialty chemical company involved in the research, development, and manufacture of high performance liquid resins, coatings and adhesives worldwide. Quinn is comprised of three divisions: the Coatings and Adhesives (C&A) Division, which manufactures solvent-based, water-based and 100% solid urethane products; the QureTech® Division, which manufactures UV and E-beam curable products; and the Shoe Finish Division, which manufactures shoe-related products.

Quinn is working on ISO 9001 certification for both its C&A and QureTech® Divisions and plans to obtain certification in late 1996. These two divisions are located in one facility and will be certified together. During the ISO 9001 certification process, the managers involved with quality, safety, and environmental issues became aware of the developing ISO 14001 EMS Standard and began investigating whether Quinn should also pursue EMS certification.

Drivers for Implementing an EMS

As a chemical manufacturer and formulator, Quinn has significant environmental obligations. These include the need to comply with an ever expanding set of regulations; the need to develop more environmentally-friendly products; and increasing demands from customers for assistance in complying with their environmental, health and safety requirements. Quinn concluded that implementation of an EMS would improve and properly focus the company's efforts to meet its environmental obligations. As with other businesses today, Quinn operates with a lean workforce in all areas (including its environmental and safety department) and strives to be more efficient with the limited resources currently available. The company views the establishment of an EMS as a process that forces it to better organize its priorities and projects, to identify problems and potential exposures, and to respond in a proactive manner. It goes without saying that preventing an incident is much more efficient than simply responding to one.

It was concluded that Quinn would eventually require ISO 14001 certification in order to compete internationally, just as companies now need ISO 9000 certification to compete in certain markets. However, as Quinn was experiencing greater commercial pressures to obtain ISO 9001 certification, the company opted to develop and certify its quality management system first. It was determined that by implementing the EMS after ISO 9001 certification has been obtained, Quinn could take advantage of lessons learned from the ISO 9001 experience. For example, the employees would be knowledgeable about management system concepts and certification processes.

Self-Assessment

Quinn became involved in the EMS Demonstration Project to learn more about the EMS implementation process and to facilitate the establishment of an EMS for the QureTech® and C&A Divisions. As a first step, Quinn performed a self-assessment of its current environmental and safety programs. The company decided to incorporate safety into Quinn's EMS because of the close relationship and numerous overlaps between safety and environmental concerns in the specialty chemicals industry. The Director of Safety and Environmental Affairs conducted the preliminary self-assessment using the tool developed by NSF. The company's officers then reviewed and commented on the results of the self-assessment. The process was not as time-consuming as anticipated — approximately 20 to 25 hours were needed to perform a comprehensive review.

The assessment showed that Quinn should concentrate its efforts toward (1) developing more formal environmental and safety policies and procedures and (2) improving communications on environmental issues with its neighbors, customers, and other stakeholders. Efforts to obtain ISO 9001 certification were reflected positively in the EMS self-assessment, especially in the areas of work policies and procedures, documentation, document control, and training. In addition, compliance with the OSHA Process Safety Management (PSM) regulation reflected positively in our processes for evaluation of problems and management of change. It was determined that many procedures that were originally developed for compliance with the PSM standard could be extended to cover environmental actions not currently addressed by these PSM procedures.

Implementation

With the self-assessment completed, the next obvious step was to implement the changes needed to bring the program into line with the requirements of ISO 14001. Although formal EMS implementation has been delayed until after ISO 9001 certification has been obtained, Quinn continues to develop elements of its EMS on a case-by-case basis as opportunities arise. For example, as procedures or practices are developed to meet ISO 9001 or various regulatory requirements, Quinn considers how these procedures or practices might be modified to help us meet ISO 14001 requirements at the same time.

The biggest hurdle in the implementation process continues to be devoting the time and resources necessary to develop the missing components of the system, to improve upon the existing components, and to maintain the system once it is in place. With the employees working at a significant pace, this can be a challenging situation, especially in the final push toward ISO 9001 certification.

Final Thoughts

Quinn believes that there are some issues that need to be addressed with regard to ISO 14001 implementation. In particular, there is the issue of registrar access to compliance audit reports and the potential impacts of this access on a company's ability to maintain these reports as privileged documents. Since conformance with the ISO 14001 Standard would require

Lockheed Martin Federal Systems

Background

The Lockheed Martin Federal Systems site in Manassas, Virginia has as its mission software development, hardware integration, and special purpose semiconductor device manufacturing. The customer base of the site includes the US Department of Defense, other federal agencies (to include space applications), commercial companies, and foreign governments.

The Manassas site has a strong history of compliance in all environmental media. The compliance posture has continued through two previous owners (IBM and Loral Corporation) and continues with Lockheed Martin.

Drivers for Implementing an EMS

The site's compliance record reflects a culture of compliance among site personnel; it is this culture, combined with the interest in continued success in its markets, that generated interest in exploring ISO 14001. Similar foreign interest in ISO standards was the driver for the site to pursue and obtain ISO 9001 certification in 1995.

The site plans to continue its market exploration outside the US. To be successful, this effort will almost certainly require ISO 9001 and ultimately ISO 14001 certification. The site plans to seek ISO 14001 certification as soon as feasible, especially because the ISO 14001 Standard was officially published in September 1996.

Self-Assessment

To help plan for ISO 14001 certification, we compared the Standard's requirements against the EMS that was already in place at the site. We performed an analysis to identify the gaps between what we had in place and what we needed to meet ISO 14001 requirements. In general, we found most of the elements were in place, although some enhancements were needed. Certain elements of ISO 14001 were essentially complete, such as document control and records procedures. These were the result of the site's effort in ISO 9001. In fact, the close relationship between ISO 9001 and ISO 14001 became evident during the gap analysis. The cost of obtaining ISO 14001 certification is expected to be significantly below that of ISO 9001 because:

- existing environmental programs are strong; and
- many overlaps between ISO 9001 and ISO 14001 were identified (particularly in the area of documentation).

companies to periodically evaluate their compliance with applicable environmental laws and regulations, many companies may be concerned about potential loss of audit privilege as a result of ISO 14001 registration.

Implementation and maintenance of the EMS will be a challenging task, but a necessary one which should be very rewarding both in cost-savings as well as in protection of the employees and the environment.

Implementation

To satisfy the requirements of ISO 14001, the site environmental program needed to be enhanced in several areas. Primarily, we needed to formalize a policy statement and document our goals and objectives. In addition, the site needed to implement a formal environmental assessment program and strengthen its existing audit program. As part of this effort, we have strengthened our existing compliance audit program and developed an EMS audit program. The latter is focused more on our posture relative to ISO 14001. Although the two programs have a different focus, we feel both are important aspects of the site environmental program. A schedule of implementation activities is shown below.

Activity	Completion Date	Status
Develop / enhance audit checklists	August 1996	Complete
In-house auditor training for select site personnel	April 1996	Complete
Develop environmental assessment process	May 1996	Complete
Integrate ISO 14001 elements into ISO 9001 program	May 1996	Complete
Formalize environmental policy statement	September 1996	Complete
Formalize environmental objectives and targets	September 1996	Complete
Third-party walk through	September 1996	Complete
External auditor training for two members of the environmental staff	October 1996	Complete
Conduct EMS audits	November 1996	Ongoing
Update management review	December 1996	Planned
Third-party initial assessment	December 1996	Planned
Third-party final assessment	April 1997	Planned

The Manassas site has chosen its current ISO 9000 registrar to conduct the ISO 14001 registration audit.

Challenges

Perhaps the biggest challenge of the ISO 14001 implementation process was the need to develop a business case to justify the required EMS improvements. Making this business case can be particularly challenging at a site which has historically had a strong environmental program. In order to sell the need for change, we:

- worked with the site Total Quality Management group and ISO auditors to explore common system features (and possible benefits to the site of integrating these systems); and
- raised the awareness of site management regarding the potential benefits (both environmental and economic) of ISO 14001 certification.

Final Thoughts

We believe that ISO 14001 offers both an environmental and business opportunity for Lockheed Martin Federal Systems at Manassas. Through the efforts to formalize and enhance the existing environmental program, we believe the company will experience greater efficiencies resulting from:

- proper and current procedures;
- adequate and accurate data collection and calibration systems;
- well-defined processes to ensure compliance with new regulatory requirements; and
- sufficient documentation to allow more efficient coverage when the primary staff person is not available.

In addition, we believe that ISO 14001 offers a vehicle for approaching regulators to request a reduction in the frequency of on-site audits and reviews. We also believe organizations should look carefully at combining their ISO 9001 and ISO 14001 efforts into a single cohesive program to provide a transparent single program to the site. This feature will also aid in the acceptance of the total effort by site management.

Madison Gas and Electric Company

Background

Madison Gas and Electric Company (MGE), founded in 1896, is a public utility located in Madison, Wisconsin. MGE generates, transmits and distributes electricity to 120,000 customers in a 250 square mile area in Dane County, Wisconsin. MGE also transports and distributes natural gas to 103,000 customers throughout a 1,325 square mile area in seven counties.

In addition, MGE subsidiaries market non-regulated natural gas and other fuels to large commercial and industrial customers and governmental institutions nationally.

Drivers for Implementing an EMS

Over the past 30 years, the utility industry has encountered many environmental issues and has been heavily regulated. MGE initially adopted an EMS to ensure compliance with environmental regulations. Over time, the EMS has expanded to address new regulatory requirements, concern of future environmental liability, cost management, competition, audit results, and new corporate policies, goals and objectives.

MGE's key motivations for implementing an EMS based on ISO 14001 are ensuring regulatory compliance, improving the company's competitive advantage, and continually improving environmental performance over time. MGE decided to participate in the EMS Demonstration Project because it provided opportunities for:

- benchmarking its EMS with those of other project participants; and
- learning from the EMS implementation successes and problems of other participants.

Self -Assessment

As a first step, MGE hired an environmental consulting firm to conduct an independent assessment of its existing EMS. The results of the independent assessment were reviewed by company management and compared with earlier informal self-assessments. The independent assessment showed that MGE was strong in the areas of environmental policy, management support, provision of resources, among other areas. Some of the elements requiring improvement included environmental aspects identification, EMS documentation, and document control.

MGE found the self-assessment process to be worthwhile. We learned that much of our environmental program paralleled the ISO 14001 Standard very well; however, certain areas of our program lacked the depth and detail required by ISO 14001.

Implementation

Based on its self-assessment, MGE decided to incorporate the elements of the ISO 14001 Standard into its existing EMS. This decision was based on a goal of full integration of environmental concerns into the daily operations of the company. The company's Management Environmental Task Force (MET) and Green Team Leaders (GTLs) were assigned the job of integrating the elements of ISO 14001 into MGE's environmental program.

The MET, which is comprised of senior managers, establishes environmental policies, performs strategic planning, and provides resources to the GTLs. The GTLs are the implementing arm of the MET and represent the company's operating and service departments, including union representation.

The GTLs decided to focus first on two elements of ISO 14001: environmental aspects (Section 4.3.1 of the Standard), and monitoring and measurement (Section 4.5.1). Working on the environmental aspects element allowed us to review our operation again and to confirm and/or modify the basis for our existing environmental program (i.e., the issues or aspects that the program was designed to address). Working on the monitoring and measurement element provided a mechanism for communicating environmental performance to MGE departments and management. We expect to complete work on these two elements by the end of 1996. Work on the remaining ISO 14001 elements (as identified through the self-assessment) is scheduled for completion by the end of 1997.

MGE has decided not to seek registration to the ISO 14001 Standard at this time. We believe that registration would have limited value because the company does not currently participate in the international marketplace. The effort, cost, and time required to develop and maintain the written documentation required by ISO 14001 would not be offset by the benefits of registration. However, as more companies become registered, the registration process should improve and additional registration benefits should be identified. If ISO 14001 does become a standard for doing business in the future, MGE will be well-positioned for registration.

Perhaps the greatest difficulty we faced in implementing ISO 14001 was in defining *significant* environmental aspects. This element raises a number of critical issues such as determining which stakeholder concerns are significant, how "significance" should be measured, how a company ensures that all significant aspects have been identified, and how the process for identifying significant aspects should be sustained over time.

Benefits

The EMS process resulted in better environmental awareness, which in turn improved the communication between the company's operating departments and the Environmental Affairs staff. This has led to a proactive approach to environmental problem-solving whereby MGE can anticipate problems and develop cost-effective and efficient programs to address them. Improved awareness also resulted in the implementation of pollution prevention programs.

Final Thoughts

Environmental management has become an integral part of doing business today. The ISO 14001 Standard provides an additional tool for managing a company's environmental concerns in a cost-effective and efficient manner. A strong EMS can bring competitive advantage by:

- reducing costs through pollution prevention and waste minimization programs;
- ensuring sustained environmental compliance;
- reducing future environmental liabilities;
- reducing insurance costs; and
- addressing the needs of customers, shareholders, the community, and regulatory agencies.

In the future, the ISO 14001 Standard may also lead to regulatory incentives, such as fast-track permits, reduced inspections and fines, and the potential for further partnering of business, stakeholders, and government in eliminating and controlling environmental impacts.

Milan Screw Products

Background

Milan Screw Products is a small (32 employee) manufacturing firm located in southeastern Michigan. The company manufactures precision fittings for the fluid power, automotive, and refrigeration industries, and is registered to ISO 9002. There are approximately 1,500 companies in the United States in the screw-machine products industry. Most of these companies are family-owned and family-managed, and typically have approximately 50 employees.

Drivers for Implementing an EMS

There are generally few hazardous materials used in the screw-machine industry, but there are environmental issues associated with the containment of coolants and cutting oils, the need to find substitutes for chlorinated solvents, and the disposal of waste oils. The most persistent environmental challenge is the containment of cutting oil within production machines. Many screw-machine shops have production equipment that was manufactured in the 1950s, which may have leaky gearbox covers and inadequate oil splash guards. Failure to adequately contain cutting oils also creates cleaning and disposal issues, such as stained carpets, solid wastes (saturated oil absorbents swept from the shop floor), and liquid wastes (solvents and soaps used in parts or equipment cleaning). The cutting oils also can have health and safety implications.

While it may be simple in the industry to accept the oily film that can coat everything from the light fixtures to the floors as a "fact of life," Milan Screw Products decided to improve the management of its environmental issues. Top management recognized that a clear environmental policy, objectives and targets, written procedures, training, and corrective action (elements similar to its quality management system (QMS)), would help the company to proactively manage its environmental practices.

Implementation of an EMS was motivated by the company's desire to improve its environmental performance. While progress had been made in the past, the organization was lacking a structure for its environmental management program and had no means to measure progress. In light of the company's QMS experience, the EMS approach appeared to be the best way to achieve its goals.

Self-Assessment

In March 1995, Milan Screw Products joined the EMS Demonstration Project. One of the first steps in the project was to conduct a self-assessment. Milan Screw Products used NSF's self-assessment tool, which enables an organization to determine how its EMS measures up against ISO 14001. The company's score was very low because it did not have a formal EMS in place. However, the low score did not discourage Milan Screw Products; instead, the company set a goal to fully implement an EMS by June 1996.

Implementation

One of the first steps in implementing the EMS was the establishment of a cross-functional environmental task group (ETG), which consists of five representatives from production, support, and management. The ETG is responsible for assuring continued regulatory compliance (including the submission of all permit applications and reports to federal, state, and county environmental agencies) and improving the company's environmental performance. Milan Screw Products found that participation of shop-floor employees is essential to the successful implementation of its EMS because participation encourages employee ownership of the process. Participation in the ETG has heightened environmental awareness among its members and enhanced their understanding of the company's environmental responsibilities. In addition, environmental compliance activities are now being managed effectively by the ETG and require limited top management oversight.

In order to determine the company's environmental aspects, ETG members first used brainstorming techniques. They listed all of the company's inputs (e.g., energy, water), outputs (e.g., oil mist, noise), and conversions (e.g., steel bars to chips, cutting oils to mist). The ETG also examined the company's purchases, processes, and waste streams. Stakeholders were identified, and some stakeholders were interviewed so that the company could gain a better understanding of their environmental concerns. These stakeholder concerns were added to the list of environmental aspects. Once the environmental aspects were identified, the ETG then rated the probability of an environmental impact occurring and the severity of the impact if it were to occur. The environmental aspects and impacts were then grouped into general categories, such as oil-related problems.

Based on the assessment of environmental aspects, it became clear that the company's primary environmental objective should be oil recovery. During the same time period, Milan Screw Products had been contemplating the need for a new manufacturing facility. The identification of the company's environmental aspects and impacts provided additional impetus for the development of a new facility. The identified environmental aspects and impacts and other elements of the company's EMS have played a significant role in determining how the new facility will be designed and built. The company will continue to perform oil recovery practices at the existing shop (in accordance with its environmental objective), but will not set numerical targets until the new facility has been completed.

Milan Screw Products has found that the structure and responsibility requirements of ISO 14001 are easier to manage in a small company. Milan Screw Products has formed six teams for quality and productivity purposes. These teams have been given decision-making authority and have been effective contributors to the overall management of the shop. Over time, the teams also will support the company's environmental management efforts. The ETG will continue to spearhead the EMS program since the company owner, plant manager, quality manager, safety manager, plant supervisor/environmental coordinator, and a representative from production staff are actively involved. The key to success in a small company appears to be the team approach, since small businesses seldom have the luxury of dedicating a person to manage environmental affairs on a full-time basis. The team approach also has fostered effective internal communications.

Finding the time to train employees can be a challenging aspect of running a small business. To meet this challenge, Milan Screw Products conducts training sessions one half hour before or after the employees' normal shift. The company also has been quite successful at holding "brown bag" sessions, where employees bring their lunches, participate in a training presentation, and remain "on-the-clock" for the lunch/training period. The company also has videotaped training sessions to facilitate the training of new hires. The ETG has supported the training effort by gathering and compiling training materials.

Milan Screw Products has gone beyond the requirements of ISO 14001 by soliciting the views of external interested parties. The company has found that an effective external communication program builds trust. The company has been straightforward with the community about potential oil problems and the community has been very supportive of the company's environmental efforts and its plans for the new facility. In addition, communicating about environmental management issues with its customers has enhanced their appreciation of Milan Screw Products as an environmentally responsible company and a leader in the industry.

Since Milan Screw Products has a ISO 9002-registered QMS, the company has a sound document control process in place. The QMS document control procedures will be adapted where applicable, and the corrective and preventive action procedures will be used in the EMS. The company intends to utilize some of the lessons it has learned through its QMS about data collection and monitoring and measurement and apply these lessons to the EMS.

Milan Screw Products has gained experience in management system auditing through implementation of its QMS. Top management has performed QMS audits with the help of an auditor training guide prepared by a QMS consultant. The company has conducted in-house auditor training with the help of the guide and has used the auditor training guide (where applicable) in conducting its EMS audits. Milan Screw Products plans to continue to integrate its ISO 9002 QMS with its ISO 14001 EMS, including development of a single manual that will incorporate both quality and environmental management system elements.

Challenges

To date, the biggest challenge that Milan Screw Products has encountered has been allocating the human resources to the EMS project in the face of high production demands. The company has also had to overcome some old practices by explaining to employees the rationale behind the changes and the company's desire to successfully implement an EMS.

While Milan Screw Products has not completely implemented its EMS, it has made significant progress over the last eighteen months. Groundbreaking for the new facility (in June 1996) has caused the company to shift some of its priorities to support the new construction. The company hopes to fully implement its EMS by April 1997.

Benefits

Milan Screw Products believes that there are numerous potential benefits associated with an effective EMS. An EMS can improve employee retention, new hire selection, and working conditions, as well as the perceptions of its suppliers, lenders, customers, neighbors, and regulators. The EMS also can ease management concerns that an environmental problem could arise from simple ignorance or lack of training.

It may be difficult to perform a cost/benefit analysis of EMS implementation because some of the potential benefits are intangible and cannot be assigned a monetary value. It also is impossible to tally citations that are not written, fines that are not levied, and lawsuits that are not filed.

Milan Screw Products' proactive environmental program has improved its stature and fostered better communication with regulatory agencies. The company will also benefit from being one of the first in its industry to successfully implement an EMS — this may promote the perception among customers that the company is more innovative, more responsible, and perhaps more desirable than their competitors. The company has found that although many of the benefits of an EMS cannot be anticipated beforehand, they will be discovered as pleasant surprises after implementation.

Final Thoughts

Milan Screw Products has not determined if the company will pursue EMS registration — that decision will depend on factors such as costs and customer demand. The company intends to fully implement its EMS and then evaluate the need for registration next year. Obtaining EMS registration would be a source of pride and it might improve customer perception of the company, but the company has not determined whether the costs associated with registration can be justified.

Top management believes that organizations that choose to implement an EMS should not get discouraged if EMS implementation efforts need to be set aside occasionally. You can start, stop, and resume your efforts as needed — your aspects won't change unless you change your processes or products — and any progress that you have made will still be there.

Milan Screw Products encourages other small companies to implement an EMS. An EMS can help a small or medium-sized organization to prevent environmental problems from occurring (rather than mitigating their resulting impacts), which may keep a small company in business. An EMS enables an organization to look at its business from another perspective. Many organizations have considered quality, safety, and other functions as integral parts of their business, and they should look at environmental management in the same light. Looking at all of the critical business functions together provides great opportunities for improving the organization as a whole.

NEO Industries Ltd.

Background

NEO Industries (NEO) is an international service company specializing in the industrial hard chrome plating of steel and aluminum mill work rolls. The company, which is headquartered in Portage, Indiana, consists of small service facilities in North America and Europe that are strategically located in close proximity to these mills. NEO's core business is the application of a thin layer of hard chrome to the rollers in the mills. This chrome layer increases resistance to wear and improves the quality of the rollers' surface characteristics.

Drivers for Implementing an EMS

NEO's business dictates the need for an EMS. Due to the nature of the processes and materials employed, NEO has been proactive in the environmental design and operation of its facilities. An environmental consulting company supported NEO in planning future environmental initiatives by performing environmental audits of all of the company's facilities.

NEO decided to participate in the EMS Demonstration Project based on a number of environmental concerns, including: (1) air emissions; (2) handling, disposal and proper containment of hazardous wastes; (3) employee health and safety; and (4) compliance with local and federal regulations. NEO also believes that implementation of an effective EMS will promote market leadership, enhance stakeholder confidence, and help to ensure the public that the company is effectively managing its environmental obligations.

Self-Assessment

NEO initially selected its Portage, Indiana facility as the pilot location for developing and implementing an EMS. An EMS self-assessment was conducted at the Portage facility using the NSF self-assessment tool. Considerable effort was made to ensure that the internal assessors presented a candid picture of the status of the EMS.

The self-assessment confirmed that NEO had sound environmental practices, the most modern, efficient equipment available, and excellent environmental design and facility construction. However, the self-assessment also showed that formal programs and documentation to manage environmental issues were lacking. The company was proactive in the areas that it knew about, but did not have formal procedures and training to ensure that the environmental implications of new issues or conditions were adequately identified and addressed in all cases.

Implementation

As the project moved forward, NEO realized that the plan to implement an EMS at one pilot site and then roll the EMS out to other facilities was unrealistic. Given the size of the company, it was not feasible to dedicate the skilled resources necessary to adequately implement an EMS one site at a time. As a result, NEO shifted away from tackling the EMS as a pilot project at one plant to organizing a team to pursue EMS for all plants simultaneously. In this manner, NEO could use skills throughout the organization to support development of the EMS.

During the course of the project, NEO wrote an environmental policy based on NSF 110 and ISO 14001. The NEO policy includes commitments to the principles of compliance, prevention, communication and continuous improvement. The management team also chose to incorporate health and safety management into the policy. The NEO Health, Safety and Environmental Policy has been fully implemented at all of its facilities in North America.

Over time, it became evident that establishing and maintaining a formal EMS would be a greater challenge than NEO had originally envisioned. NEO held several discussions (both internally and as part of the EMS Demonstration Project) about the benefits of initiating an EMS once an ISO 9002 project was completed. This approach has the advantage that the systematic documentation and procedures needed for an EMS are similar to those needed for the ISO 9002 quality system.

Although NEO has an excellent reputation for quality and service, it was just embarking on certification to ISO 9002. NEO shifted its priority and immediately focused on certification to ISO 9002. Then NEO utilized this methodology to establish and document an effective EMS. It feels that experiencing the rigors of ISO 9002 certification will facilitate the development and implementation of an EMS. The two systems will follow a consistent format, and much of the required training will be used to satisfy both standards.

Through the EMS Demonstration Project, NEO recognized some of the difficulties in developing an EMS. Without the advantage of an existing ISO 9000 system, it lacked some of the procedures, documentation and know-how that is advantageous in developing an EMS. At the same time, compliance with new air quality standards and NEO's ongoing need to upgrade certain processes diverted resources away from EMS development. NEO did not progress as far as hoped due to the numerous demands of running a business. Hence, NEO can claim only partial EMS implementation at the close of the project.

Benefits

NEO has already experienced some of the benefits of EMS implementation and expects to see other benefits as system development moves forward. First, EMS development has heightened employee awareness of environmental issues. NEO is more focused on areas that can impact the environment and has taken steps to eliminate certain processes that must be controlled due to their environmental impacts. EMS development has also helped NEO to utilize its resources (both in-house and outside) more effectively.

NEO anticipates that implementing an EMS will result in more effective approaches for managing compliance, especially through documentation of existing and new procedures and processes. Environmental training will also be formalized and tracked.

Other anticipated benefits include improved employees' attitudes, better financing capability, and maintained stakeholder confidence. NEO believes that continued attention to environmental matters has helped (and will continue to help) to retain long-term customers.

Final Thoughts

The EMS Demonstration Project was an excellent opportunity to learn about the emerging ISO 14001 Standard. The blend of large and small companies, represented by individuals from both environmental and operational areas, provided participants with broad exposure to the challenges in implementing an EMS. The environmental consultants who volunteered to participate in the project were extremely helpful to all participants. The cooperative approach of the EPA and local officials bolstered the development of the project.

Participation in the EMS Demonstration Project has been of great value to the NEO organization. The company is more focused on environmental management due to the support of NSF International, the EPA and the input of other participating companies and sponsors. It has helped NEO to establish priorities and set a goal for implementing an effective EMS in 1997.

NIBCO Incorporated

Background

NIBCO Incorporated (NIBCO) is a worldwide manufacturer of fluid handling (plumbing) products for the residential, commercial and industrial markets. Founded in 1904, NIBCO is a family-owned Fortune 1000 and Forbes 500 company. NIBCO has a total of 13 manufacturing facilities, 11 of which are ISO 9002 certified. NIBCO employs approximately 3,200 associates worldwide. NIBCO is committed to continued excellence, leadership, and stewardship in protecting the environment and conserving natural resources. Environmental protection, including compliance with applicable laws and regulations, is a primary management responsibility and the responsibility of every NIBCO associate.

Drivers for Implementing an EMS

In light of constantly and rapidly changing public expectations, community concerns, customer expectations, and federal, state and local legislative and regulatory activities, successful companies can no longer merely respond to these changes — they must proactively identify and manage their environmental obligations. NIBCO realized that it had to learn how to anticipate these changing expectations and adopt new ways of providing for continuous improvement in its efforts to manage environmental compliance and environmental performance. The company views an EMS as a perfect tool for presenting and supporting its environmental philosophy. The fundamental driving force behind developing and implementing an EMS at NIBCO was the desire and need to formally define and put in place the structure, practices, procedures, processes, and resources necessary to ensure regulatory compliance and continuous improvement in environmental performance.

Implementation

NIBCO's EMS is focused around two distinct yet intimately connected concepts: Total Quality Environmental Management and Waste Minimization and Pollution Prevention (WM/PP). In designing our EMS, the key objective was to expand upon the concepts, tools, and experiences of our ISO 9002 Quality Management System (QMS), and to apply them to environmental management, including environmental compliance. This approach allowed NIBCO to integrate the control, monitoring, and other management aspects of the QMS with the cost savings and other benefits of WM/PP. Having a certified ISO 9002 QMS was an advantage — our associates understood what EMS development would mean in terms of resources and time.

The process of developing an EMS involved an in-depth evaluation of the existing ISO 9002 QMS and developing national and international EMS standards (e.g., ISO 14001, NSF 110, BS7750, and CSA Z750), as well as a review of the company's environmental policy and environmental objectives. This evaluation resulted in the development of a NIBCO environmental management standard that meets the requirements of ISO 14001 and fulfills

NIBCO's environmental policy. This internal standard describes the minimum requirements for the development and implementation of a formalized, systematic environmental management program at each manufacturing facility.

The development, implementation, and auditing of the program is directed and supported internally by the corporate environmental department. The brunt of the work, however, is accomplished at the facility level by cross-functional environmental management teams. These teams generally include the plant manager, the plant environmental professional, the plant quality manager, and representatives from other business functions within the facility, such as production, accounting, maintenance, and safety. The application of TQM concepts, combined with the use of internal standards and the involvement of cross-functional teams, has been the catalyst for NIBCO's success in its attempts to manage environmental activities.

Benefits

Because the company-wide Environmental Management Program emphasizes cross-functional team building and the importance of problem solving, NIBCO has begun to realize some of the benefits of an EMS. The most significant benefits have been: improvements in communication; the increase in environmental awareness throughout the company; the level of employee involvement and interest in environmental management efforts at the manufacturing facilities; the realization of environmental responsibility and accountability; and some operational cost savings resulting from initial WM/PP projects. Other perceived benefits include: reduced environmental risk and liability; positioning for marketplace advantage; improved compliance posture and relations with regulators; the ability to benchmark and measure progress using consistent methodologies; and strategic environmental planning and budgeting.

Challenges

The process of developing and implementing an EMS has not been without its challenges. Initial barriers that had to be overcome in order to sell the concept of an EMS to senior management and the manufacturing facilities included:

- the fear of increased liability as a result of auditing;
- the cost of technology required to meet NIBCO's policy and objectives; and
- the fear of compromising production.

We communicated to senior management that an effective EMS would help the company to reduce liabilities and environmental risks, as well as help to achieve other business goals. To increase ownership throughout the organization, NIBCO educated the workforce about the real and potential impacts on the environment due to their everyday jobs.

NIBCO found that many sections of ISO 14001 were subject to interpretation, but that no single element was too onerous to implement. The Operational Control section was perhaps the most challenging, but NIBCO believes that there is sufficient flexibility built into ISO 14001 for

companies to tailor their operational control needs based on their actual or potential environmental impacts.

The EMS implementation process has presented some significant challenges. Some of the challenges that NIBCO has faced include: limited time and resources at the site level; obtaining meaningful cross-functional involvement; dwindling inertia; lack of data required to support continual improvement; development of performance measurements (how and at what cost); lack of definition of best management practices; and the degree to which the EMS and ISO 9002 QMS can and should be integrated. We had to dispel the notion that "environment is not my job" and demonstrate that managing our environmental aspects effectively would actually help us to meet other business goals, such as reduction in downtime.

Final Thoughts

Despite the drawbacks and hurdles of implementing an EMS, the system has provided NIBCO with:

- a mechanism to control and manage operational and waste management activities;
- an effective strategy for monitoring and measuring our compliance status and promoting continuous improvement in environmental performance; and,
- a link between environmental management and the ISO 9000 QMS (as well as other business management initiatives).

In addition, by increasing the focus on documentation and document control, the EMS provides a tool to demonstrate to regulatory agencies what the company is doing to ensure compliance.

Combining the concepts of ISO 14001 and ISO 9000 have allowed NIBCO to move toward the development of a single cohesive integrated management system designed to apply to all areas of the business, and has given NIBCO another tool for meeting and/or exceeding our customers' expectations.

Pacific Gas and Electric Company

Background

Pacific Gas and Electric Company (PG&E) is a public utility supplying electric and natural gas service throughout most of northern and central California. Our service territory covers 70,000 square miles with a population of about 13 million. In 1995, PG&E's utility assets were approximately \$26.9 billion and operating revenues were \$9.6 billion. PG&E has about 22,000 employees and operates more than 1,500 facilities subject to environmental regulations.

PG&E's electricity production comes primarily from seven natural gas-fueled power plants, two nuclear units, 70 hydroelectric powerhouses, and a geothermal energy complex. PG&E also purchases power from a wide array of resources, including hydroelectric, wind, solar, biomass, and cogeneration. In 1995, its natural gas supply came primarily from Canada (64%) and the southwestern US (28%), with the remainder from California fields.

Drivers for Implementing an EMS

For many years, PG&E has had an EMS which is now in a fairly mature state. Our participation in the EMS Demonstration Project was driven primarily by a desire to benchmark our existing EMS against the developing ISO 14001 Standard and against the systems employed by other participants in the project. Our goal was to use the EMS Demonstration Project to identify areas for potential EMS improvements. PG&E's participation had the additional benefit of providing a realistic assessment of what would be required to achieve ISO 14001 certification, should a business need for certification develop. While PG&E does not market its products or services in international markets, many of our customers do. Thus, ISO 14001 certification may provide a competitive advantage in a California energy market that is rapidly approaching deregulation.

Self-Assessment

The electric and natural gas services we provide to our customers cannot be associated with specific production facilities. Even the routes of transmission can vary, as loads within our distribution system change. We determined, therefore, that our self-assessment should cover the EMS for the entire company and include all aspects of production and distribution. The self-assessment was conducted by senior managers in the environmental and law departments. Because many of the ISO 14001 requirements were already covered by the existing EMS, the principal focus of the self-assessment was on the effectiveness of EMS implementation throughout the company.

Implementation

Based on the self-assessment results, we created a prioritized action plan for desired EMS improvements. In developing the action plan, we recognized that some EMS improvements would have existing environmental or business justifications, while others would not proceed without a business decision to seek ISO 14001 certification.

PG&E has always enjoyed strong senior management support for its EMS, particularly as it facilitates cost-effective compliance with environmental laws. Over the years, PG&E has undertaken extensive education efforts with its employees to underscore the need for continual improvement in environmental practices. This education effort helped to dispel the perception that, since some past practices were adequate in protecting the environment, there was no reason to change or improve these practices.

Challenges

We foresee two major challenges to achieving ISO 14001 certification. The first is that the Standard's strong emphasis on documentation runs counter to an ingrained corporate bias to minimize paperwork. Given that current environmental regulations already mandate extensive recordkeeping requirements, establishing new voluntary documentation requirements may be a hard sell, particularly if existing practices have functioned adequately to protect the environment. As regulatory agencies themselves are moving to reduce mandatory paperwork, why levy new documentation and recordkeeping requirements through a voluntary EMS standard?

The second challenge will be common to most utilities. Under ISO 9000, certification has pertained primarily to individual production facilities, not entire companies. Because we cannot tell a customer the exact source of the electrons or gas molecules we provide, certification of individual facilities to ISO 14001 is meaningless. However, if we must certify all (or even most) of our 1,500 facilities, the costs and administrative burden of certification would be unacceptable. PG&E will work with the appropriate accreditation organizations in an attempt to find an acceptable certification process for the utility industry.

Benefits

Our EMS has helped the company to ensure compliance and to reduce costs. Our audit function feeds the continuous improvement cycle. We have seen cost reductions as a result of reduced hazardous waste generation, improved management of hazardous waste recycling and disposal, and rapid deployment of new, cost-effective compliance approaches. In addition, the EMS has helped PG&E to reduce environmental impacts in other areas (including reductions in impacts on fish and wildlife and reductions in air pollution).

Final Thoughts

PG&E believes that its participation in the EMS Demonstration Project supported our corporate policy to continuously improve our EMS. Our participation also helped to position us for eventual ISO 14001 certification, if such certification is deemed a valid business need.

Pitney Bowes Inc.

Background

Pitney Bowes is a leading provider of mailing, messaging and document handling products and services with 30,000 employees in over 100 countries around the world. Pitney Bowes has two primary manufacturing facilities, one located in Stamford, Connecticut and the other in Harlow, United Kingdom. The company's core business consists of mailing products and systems, complemented by the additional product lines of facsimile systems, copier systems, financial services and management services. Pitney Bowes Inc., headquartered in Stamford, Connecticut, registered annual revenues in 1995 of over \$3.5 billion, an increase of 9% over the previous year.

Drivers for Implementing an EMS

The impetus to implement an EMS and to attain certification to ISO 14001 originated in the company's Corporate Safety and Environmental Affairs Department. EMS implementation was viewed as a means to improve upon and integrate existing environmental programs. Certification to ISO 14001 was viewed as a means of attaining competitive advantage and ensuring long-term security in the marketplace. EMS implementation also provides a vehicle to demonstrate the company's environmental commitment to customers, investors and other stakeholders.

The Harlow, UK manufacturing site was chosen to be the subject of the EMS Demonstration Project. The Harlow site is a medium- to large-sized manufacturing plant with approximately 900 employees. The site manufactures products for sale worldwide, but primarily in Europe and the Far East. Primary manufacturing processes include metal finishing, machining, plastic injection molding, product assembly, and product refurbishment. The site has a history of management system implementation, having attained certification to both BS 5750 and ISO 9002 several years earlier. In fact, this pre-existing ISO culture was one reason that the site was chosen for the pilot. Furthermore, predictions have been made (based on the company's ISO 9000 experience) that any marketplace effects of ISO 14001 would likely be felt first in Europe.

Self-Assessment

The first step in the EMS implementation process was to perform a self-assessment using the NSF self-assessment tool. The assessment was performed at the Harlow site by a group of middle managers. After each manager completed the self-assessment checklist individually, all of their responses were pooled and the response most frequently cited was chosen. The results of this self-assessment indicated that the site was at the beginning stages for most of the elements of ISO 14001 — most of the elements were rated as either "no action taken" or "action initiated." The self-assessment team did not rate the site as "complete" or "evaluated and sustained" for any of the elements of ISO 14001. This self-assessment provided a good starting point from which the Harlow site could plan its implementation activities. It also required all of the managers

involved in the self-assessment process to think about how each element of ISO 14001 related to their organization.

Implementation

In April 1996, after five months of implementation activity, the self-assessment process was repeated. This time the results showed encouraging progress. Several ISO 14001 elements had by now earned a "complete" ranking, although none had yet become "evaluated and sustained." When the second self-assessment was conducted, only one element remained in the "no action" category. Clearly, the site had made significant progress toward full EMS implementation in only a few months.

At the time of this writing (August 1996), the Harlow site is preparing for the ISO 14001 registrar's pre-assessment visit, scheduled for September. Most elements of the Standard have been fully implemented. The site has developed a detailed register of its environmental aspects, a register of applicable laws and regulations, and an EMS Manual consisting of several procedures, including those for EMS auditing, management review and emergency response. A team of individuals on-site has been trained to perform internal audits and the first of these audits has been scheduled. A process for ranking the significance of each environmental aspect has been established and applied. In addition, environmental objectives and targets have been set, based on the outcome of the process for ranking significance aspects and on the company's environmental policy. Elements of the ISO 14001 Standard which remain to be fully implemented include employee awareness training and external communication plans.

When the pilot was initiated, Pitney Bowes decided to keep the ISO 14001 initiative separate from the site's existing ISO 9000 system. Since that time, however, some small-scale integration of these systems has occurred. The EMS Manual is formatted in the same manner as the ISO 9000 manual, allowing for easier integration in the future should the company choose to do so. In addition, approximately one-half of the individuals trained to perform internal EMS audits are also responsible for internal ISO 9000 audits.

Challenges

Challenges to implementation have been surprisingly limited. Senior management has been very supportive of the pilot project and has allocated sufficient resources to ensure its success. Despite some issues with individual staffing constraints, most members of the EMS team at the site have been productive contributors.

In retrospect, the biggest challenge to implementation has been interpretation of the Standard itself. In particular the most difficult section of the Standard to interpret was section 4.3.1 ("Environmental aspects"). The choice of wording and lack of practical guidance made this section difficult both to understand and to apply. In fact, a large portion of the person-hours consumed to date on the project have been focused in this area. Even though the register of environmental aspects has been completed for the Harlow site, modifications to this register continue to be made on a regular basis.

Final Thoughts

Participation in the EMS Demonstration Project has been a rewarding experience for Pitney Bowes. The project provided a much needed structure for implementation activities. In less than one year from its EMS kick-off meeting, the Harlow site is ready for a certification assessment. We believe that having a structured, certified EMS in place will improve our environmental performance and add real value to the business.

TRINOVA Corporation

Background

TRINOVA Corporation, headquartered in Maumee, Ohio, is a worldwide industrial manufacturer and distributor of engineered components and systems. TRINOVA's companies, Aeroquip and Vickers, operate approximately 75 facilities in 18 countries. The pilot facility chosen for the EMS Demonstration Project has an excellent environmental compliance record, is ISO 9001 certified, employs 125 people, and manufactures hydraulic fittings for the aerospace industry.

Drivers for Implementing an EMS

TRINOVA did not join the EMS Demonstration Project based on any internal driver to implement ISO 14001. Rather, the possibility that this voluntary Standard might become a de facto requirement of doing business internationally created a need to learn as much as possible about ISO 14001, so that an implementation strategy could be developed. In short, our motivation to learn about the ISO 14001 Standard and be prepared with an implementation strategy was business driven.

Self-Assessment

An assessment of the site's environmental management practices against the requirements of ISO 14001 was conducted by the pilot facility's environmental manager and an engineer from corporate headquarters who had recently performed a comprehensive compliance review at the facility. These two individuals then discussed and resolved any differences in their findings and jointly produced a draft assessment report. The draft report was critiqued by an independent EMS consultant before being finalized and submitted for the EMS Demonstration Project. This outside critique ensured that the assessment provided an accurate basis upon which to move forward. The critique also improved our understanding of the ISO 14001 Standard at an early stage of the project.

Implementation

Although a basic action plan was formulated to address gaps in environmental management practices (as identified in the self-assessment), there was uncertainty as to how to reach full EMS implementation. Because of the sheer number of detailed requirements in ISO 14001, the task of fully implementing its requirements seemed daunting. One doesn't simply pick up and read ISO 14001 and then immediately begin to implement it. A great deal of time was required to review the Standard and attend Demonstration Project meetings to build understanding and confidence before resources were invested in EMS implementation.

Implementation progress was limited at first because our approach was to focus on the 17 elements of the ISO 14001 Standard one at a time rather than on the Standard as a whole. We believed that "environmental aspects" was an element that needed to be expertly fashioned and installed before moving on to "legal and other requirements," which also needed to be expertly fashioned and installed before moving on to "objectives and targets," and so on. A key to improving our implementation progress was the realization that systems in place for compliance with US environmental regulations would fulfill most ISO 14001 requirements (as noted by an EMS Demonstration Project guest speaker who was one of the leaders of the US Technical Advisory Group).

Based on this understanding, we began to incorporate elements of our pilot facility's existing compliance program and procedures into the framework established for implementing ISO 14001. The initial EMS thus developed, though unrefined, can be improved over time, consistent with the need to demonstrate continual improvement in environmental performance. Using this approach, we have made much better progress toward complete implementation of ISO 14001 at the pilot facility. As a company that lacked a mature EMS at the outset of the EMS Demonstration Project, TRINOVA is hardly in a position to offer advice to others on deeper understanding of the fine points of ISO 14001; however, we would recommend this approach to other companies that experience difficulty in initially implementing their EMS.

A key element of our strategy during the Demonstration Project was to promptly form an interdisciplinary team to identify environmental aspects, establish one or two targets related to these aspects, and then carry out a program to achieve these targets. It was felt that some early, tangible results would allow EMS development to be viewed as a dynamic and practical process, rather than a paperwork / procedures exercise. The team felt strongly that demonstrating early results would enhance the EMS Demonstration Project's acceptance and momentum at the facility.

This strategy proved to be effective. People get excited when they have a feeling of accomplishment in lessening the environmental impact of their jobs on the community in which they live. Due largely to this approach in the earlier stages of the project, development of various written procedures required by ISO 14001 (the more tedious part of implementation) has proceeded in earnest and a positive attitude has been maintained.

One of the key challenges in implementing ISO 14001 is the Standard's great emphasis on written procedures. More detailed documentation requires greater maintenance. While it is clear that any system must be documented to be worthwhile, it does not follow that the greater the level of documentation, the greater the value that will be added.

Benefits

The "ISO 14001 team" was comprised of the pilot facility manager, the environmental manager, key workers from various areas within the facility, and a corporate representative. The team found that people on the manufacturing floor who actually work with processes which impact the environment have a very thorough knowledge of those processes, while environmental managers at the facility and corporate level had the most thorough knowledge of existing and emerging

regulations. It was demonstrated during the project that the EMS can bring these people closer together. As employees' roles become better defined, and as information flow between employees improves, they become better informed and proceed to more effectively fulfill their roles in managing environmental activities. A broad-based, improved understanding of operations, coupled with the systematic approach described by ISO 14001, supports environmental improvements.

In addition, based on the systematic approach and the use of interdisciplinary teams, the pollution prevention projects which were identified and implemented at the pilot facility, have reduced the site's direct costs. Other pollution prevention projects should help the site to avoid certain costs in the future.

Final Thoughts

Our experience with the EMS Demonstration Project has shown that a systematic approach to environmental management makes sense; however, we are somewhat skeptical at this time about the potential benefits of ISO 14000 registration due to our experience with ISO 9000. ISO 9000 registration at the pilot facility has not resulted in the domestic or international trade opportunities predicted in the earlier days of that Standard. Little value has been added to offset the costs of maintaining ISO 9000 registration. Based on this experience with ISO 9000, our current environmental strategy calls for implementing a systematic approach to environmental management, but not for seeking ISO 14001 registration unless a business advantage can be demonstrated.

The EMS produced and the experience gained as a result of the EMS Demonstration Project will serve as guides for TRINOVA's business units in which ISO 14001 registration is deemed to be a prudent business decision.

United States Postal Service

Background

The United States Postal Service (USPS) is a government-owned corporation whose mission is to provide prompt, reliable, and efficient mail service to all communities in the United States. With over 720,000 employees working at more than 40,000 post office facilities nationwide, the USPS is second only to the Department of Defense in terms of the size and reach of its operations and activities. The USPS is organized into 10 area offices, which are further subdivided into 85 districts.

Although one might not immediately associate the USPS with potentially significant environmental impacts, a number of environmental issues relate directly to the USPS's core business processes. These environmental issues derive from, among other things:

- the 205,000 vehicles the USPS operates and maintains;
- the chemicals it uses to maintain automation and mechanization;
- the solid wastes it generates; and,
- the content of the products it sells. (For example, in manufacturing and selling postage stamps, the USPS is the largest single consumer of adhesives in the United States.)

Drivers for Implementing an EMS

During the two years immediately preceding the EMS Demonstration Project, the USPS undertook an intensive effort to improve the management and performance of its environmental program. This effort included the development and issuance of a comprehensive environmental policy statement; conduct of a thorough environmental effects (impacts) analysis of major operations and activities; subsequent development of environmental strategies, development of objectives and targets; and preparation of over 100 tactical action plans designed to implement the strategy. Senior managers from the 10 area offices and major divisions within the Headquarters actively participated in this effort. The principal focus of this effort was to:

- ensure compliance with environmental laws;
- integrate environmental considerations into business planning;
- promote individual responsibility for environmental protection and enhancement;
- work more closely with customers to address their concerns;
- track progress in meeting environmental goals and objectives; and
- set environmental standards for suppliers.

While this undertaking was and continues to be immensely successful, senior management recognized that a key element was still missing — the basic framework for a comprehensive EMS. While not necessarily intending to pursue formal ISO 14001 registration, the USPS felt that the requirements set forth in the ISO 14001 Standard described activities that any

environmentally responsible organization should be doing as part of its routine business practice. From that perspective, the USPS was eager to see just how well its program "measured up," while at the same time identifying areas where more emphasis was needed.

Recognizing that there was a great deal to learn about what an EMS is and what is required to successfully develop and implement one, the USPS decided that active participation in the EMS Demonstration Project would provide valuable insight and practical experience. Accordingly, the USPS decided to participate in the project with the assistance of a private, non-profit third-party organization (the Logistics Management Institute (LMI)), a federally-funded research and development center located in McLean, Virginia.

Self-Assessment

LMI staff members (who were relative newcomers to the EMS concept) underwent NSF International's extensive EMS training program and conducted assessments at representative USPS facilities. Facilities selected for assessment were the USPS Headquarters located in Washington, DC, and the Southwest Area (SWA) Office, located in Dallas, Texas. Initial assessments were completed in April and May 1995, with follow-up assessments conducted in the spring of 1996.

The assessments, which were conducted by LMI staff using the NSF self-assessment tool, included face-to-face interviews as well as extensive documentation reviews. Selected field facilities (such as the Dallas Bulk Mail Center) were also visited so that assessors could determine the degree to which policies and procedures were actually being implemented. At the USPS Headquarters, interviews were conducted with key members of the Environmental Management Policy Office, while at the SWA Office, the area environmental compliance coordinator was the principal contact. The results of the initial self-assessment showed that the SWA Office was roughly at a 25% implementation level. The Headquarters Office was found to be at 49% implementation level because the extensive strategic planning initiative and other actions were already underway at that location.

Implementation

Based on the self-assessment results, the USPS was particularly encouraged to note that many of the requirements of ISO 14001 were already being addressed to some degree. (In fact, almost any organization with a formal environmental program already has many elements of an EMS in place.) The principal reason for the disparity in EMS implementation between the two pilot locations of USPS organization was the fact that seven key district environmental coordinator positions in the SWA were unfilled, and the single area coordinator was totally engulfed in managing day-to-day operations. This left little time for the SWA organization to focus on EMS implementation activities. Nevertheless, significant improvements were noted at both levels during the reassessment one year later. The Headquarters Office improved to 87% implementation, while the SWA Office achieved 51% implementation — almost a 100% improvement at both organizational levels.

EMS areas where the USPS was found to have particular strength (or to have made the most improvement over the year) included environmental policy, objectives and targets, resources (especially environmental staffing), training and awareness, documentation, compliance auditing, communications, and management review. Key areas that required additional emphasis included development of performance indicators, impact and risk analysis at the area level, records management, and EMS auditing.

Benefits

While the USPS has not made a final decision regarding formal ISO 14001 registration, it does recognize that there are many tangible benefits from implementing a formal EMS. An EMS establishes a basic framework for a sound environmental program and subsequent environmental performance. This in turn should serve to improve the overall condition of the environment by reducing or eliminating negative impacts. An EMS should also result in more effective compliance management, by ensuring that field operations are properly identifying and addressing environmental concerns, allocating resources wisely, coordinating activities with other key program offices, and reviewing and improving internal processes and procedures.

In addition, there are other compelling reasons for EMS implementation, such as:

- potential customers may require it (especially in the international marketplace);
- facility neighbors may want it (public image enhancement); and,
- it may affect relations with regulators and future liabilities (e.g., facilitate permitting, reduce frequency and depth of inspections, and reduce severity of fines and penalties assessed).

In view of these considerations, the USPS will require the nine remaining area offices to complete initial EMS self-assessments during 1997. This assessment will give the area environmental coordinators an indication of where their strengths and weaknesses are, and how much work needs to be done to meet the requirements for a successful environmental program. Results of those EMS assessments will be input into the newly-developed Environmental Management Information System designed to facilitate high level corporate management review and tracking. Periodic reassessment results will be used to monitor progress across the USPS as each area strives to meet all requirements of the ISO 14001 Standard.

Final Thoughts

As with any company, large or small, the USPS knows that the future will likely bring increasing environmental challenges and opportunities. By meeting those challenges and opportunities head-on, the USPS will continue to ensure a safe and healthy environment, present a positive public image as a high performance organization, reduce overall operating costs, and increase business opportunities. Establishment of an EMS will provide an essential tool for continuous refinement and improvement of its program performance, and will ensure the ultimate realization of corporate environmental policy, goals and objectives.

Washtenaw County Government

Background

Washtenaw County's involvement in the EMS Demonstration Project is unique because it was the only government agency involved. The Sheriff Department was chosen as the pilot facility to participate in the Demonstration Project on behalf of Washtenaw County. This department had a management staff that was committed to the goals of the project and was experienced with the implementation of quality management principles. In addition, this department had a clear command structure that designated responsibility and accountability.

Once the Sheriff Department was established as the facility to participate in the project, the Director and Senior Environmental Manager from the Department of Environment and Infrastructure Services met with a Commander in the Sheriff Department to brainstorm concepts for an EMS and the benefits of having an EMS in place.

The Senior Environmental Manager and the Commander discussed specific issues that would facilitate a feasible and effective EMS plan. These conversations focused on the differences between EMS implementation in a private company and a public agency, and how an EMS would fit into the Sheriff Department's command structure. A policy was created as a result of these meetings. The policy is based on the development and maintenance of a quality management system (QMS) which will include the EMS. The two systems will be integrated because the department decided that both a QMS and EMS were necessary. This system will be implemented based on a holistic set of criteria, including the ISO 14001 Standard as well as Criminal Justice policies, Corrections Operations policies, and additional standards. This will ensure that these different standards will not be applied in a piecemeal fashion.

Drivers for Implementing an EMS

The service delivery sector of Washtenaw County is comprised of several departments, and policies exist to govern these operations. The County is confronted with a need to manage these areas by utilizing a well-developed, systematic approach to management.

In Washtenaw County, the current county-wide environmental policies concern waste management (primarily recycling), purchasing of hazardous substances, and pollution prevention. Although specific policies exist in these areas, there is a need for environmental policies that are linked to a managerial approach. Several policies are currently at the planning stage; these policies relate to sustainable development, economic development that will decrease urban sprawl, and both quality and environmental management systems.

Expected benefits of an EMS include increased government accountability, and the opportunity to lead by example.

Self-Assessment

The Sheriff Department conducted a preliminary and final self-assessment. The assessments focused on the Jail Operations and Food Services. These services comprise two of the six sectors within the Corrections Division. They were selected because they involved a high level of material use, and staff were already documenting some of the material use streams. There was a need to develop and implement a more advanced method for solid waste management to replace current operational procedures. The measurables of concern were food service packaging waste materials, dry cell batteries, and ammunition shell casings.

Once these measurables were identified and documented, they were presented to the staff working in these areas. The staff agreed that a more effective approach for measurement and accountability would enhance the quality of their work. A department-wide "Quality Team" was formed to assist with the coordination of QMS/EMS policy initiatives. This diverse group is comprised of representatives from various sectors of the department, including officers, counselors, sergeants from Security Detail and Inmate Interactions Detail, and other divisions.

The Sheriff Department self-assessment identified existing procedures, resulting in a viable foundation to implement an EMS to target the measurables listed above. For the food service packaging waste materials, Food Service staff was already required to count lids and cardboard for safety purposes. For dry cell batteries, the department currently has a "gate keeper" system for collecting old batteries and distributing new batteries. This system includes a central operating station which is operated by one individual. Batteries are used extensively within the department because they are necessary for flashlights, cellular phones, pagers and other communication devices, hand held radios, and emergency response equipment. Dead batteries accumulate and require proper disposal.

The brass ammunition shell casings are captured and recycled at the County practice target range. An incentive exists to recycle these because the department returns the casings to the ammunition suppliers for rebates on new ammunition. Although these initiatives currently exist with little documentation and little management oversight, it is hoped that the EMS will improve and formalize the recycling efforts.

Challenges

In the public sector, political influence establishes policy direction and determines how resources are utilized. Most private companies have a management component that determines resource distribution; this allows flexibility in developing and adopting management schemes

to attract customers. Government agencies, on the other hand, are faced with incorporating policies that are developed at the top level based on public needs. These policies are then disseminated to the departmental level. The County is faced with the challenge of incorporating an effective EMS within an atmosphere of elected officials and political agendas that predetermine budgets and resource allocation.

Implementation

Implementation is now underway. The Senior Environmental Manager is developing the forms that will provide precise documentation for accountability within the facilities. The department is also identifying persons who will be responsible for adopting additional duties, or adjusting current duties, that will facilitate the implementation of procedures. Once these areas are developed into a working routine for the targeted facility, a management policy review or auditing process will follow. A review process will have two purposes: 1) to identify procedures that are not effective; and 2) to continue or enhance the development of areas that are achieving the goals of the EMS.

Once an EMS is documented and achieved, then the approach can serve as an example to be applied to the additional four segments of the Corrections Division. This effort will also eventually be applied to a county-wide EMS implementation program.

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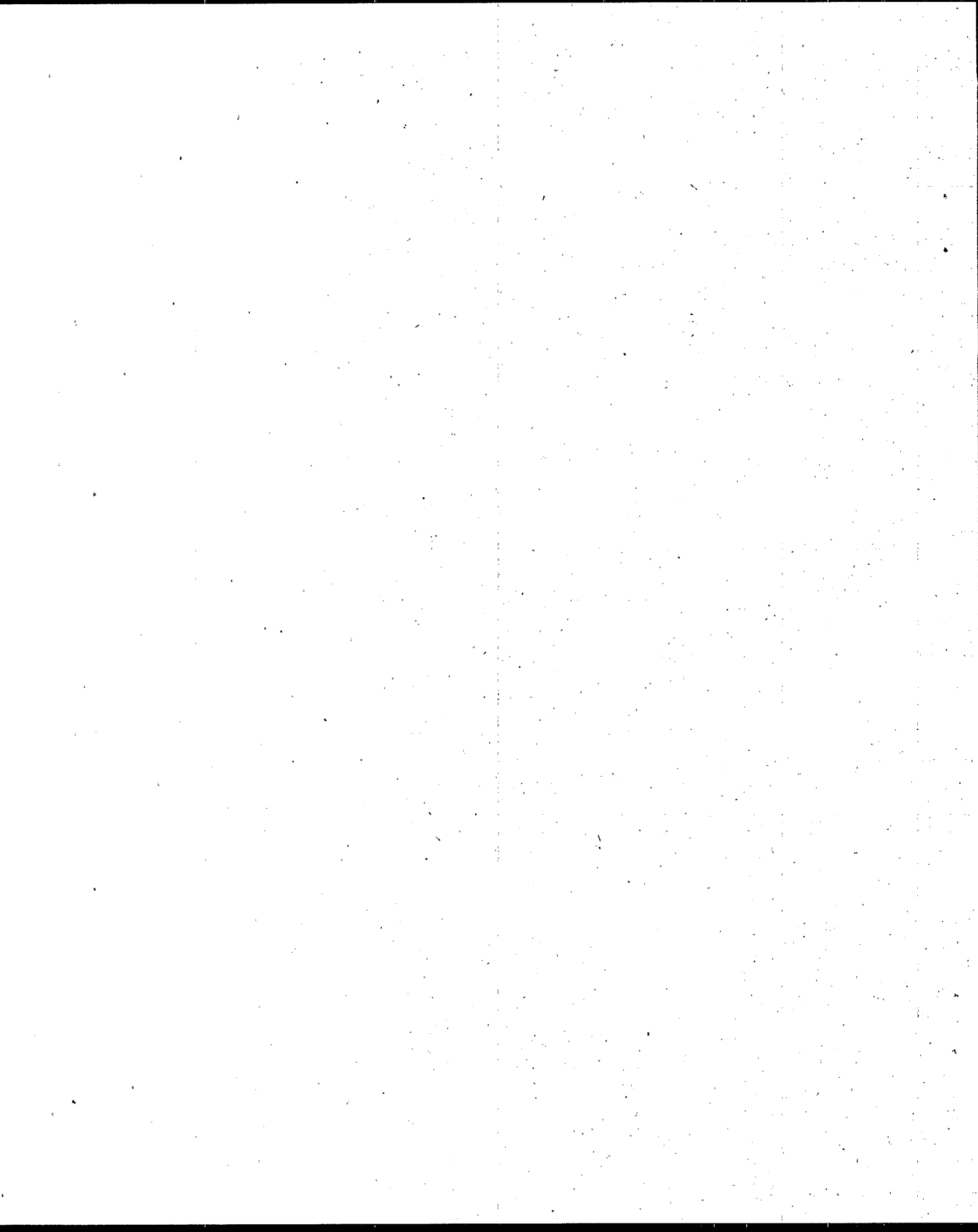
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IX. APPENDICES

Appendix A

Background on ISO 14000, EMS Standards, and Registration

The Development of ISO 14000

The **International Organization for Standardization (ISO)** is responsible for the development of the ISO 14000 series of international environmental management standards. ISO was founded in 1946 and its headquarters is located in Geneva, Switzerland. ISO has developed international voluntary consensus standards for manufacturing, communication, trade, and management systems. Its mission is to promote international trade by harmonizing international standards. Over 100 countries have national standards bodies that are members of ISO. The American National Standards Institute (ANSI) is the U.S. representative to ISO.

In June 1991, ISO created the **Strategic Advisory Group on the Environment (SAGE)**. SAGE assessed the need for international environmental management standards and recommended that ISO move forward with their development. In January 1993, ISO created **Technical Committee 207 (TC 207)** which is charged with the development of the ISO 14000 series of standards. TC 207 is comprised of various subcommittees and working groups. Representatives from the ISO member countries contribute their input to TC 207 through national delegations.

In the United States, the **U.S. Technical Advisory Group (U.S. TAG)** develops the U.S. position on the various ISO 14000 standards. The U.S. TAG is comprised of approximately 500 members representing industry, government, not-for-profit organizations, standards organizations, environmental groups, and other interested stakeholders. The U.S. TAG has the largest number of members of ISO member delegations. There are several organizations involved in the administration of the U.S. TAG's input to TC 207, including: ANSI; the American Society for Quality Control (ASQC); the American Society of Testing and Materials (ASTM); and NSF International.

TC 207 developed the ISO 14001 Standard which specifies requirements for an environmental management system (the ISO 14001 Standard is the only standard in the ISO 14000 series which is designed to be audited -- such a document is called a specification standard). ISO 14001 contains 17 elements that comprise an EMS. In addition to ISO 14001, several guidance documents are also being developed by TC 207. ISO 14001, ISO 14004 (an EMS guidance document), and three environmental auditing guidelines (ISO 14010, ISO 14011, and ISO 140012), were published in September 1996. Other documents in the areas of environmental labeling, life-cycle assessment, and environmental performance evaluation are under development. Published ISO standards must be reviewed and revised every five years.

The Emergence of EMS Standards

Numerous factors have contributed to the emergence of EMS standards. The following is a brief overview of some of the major factors.

ISO 9000

The ISO 9000 series of international quality management standards was published in 1987. The standards were created to promote consistent quality practices and to facilitate international trade. The ISO 9000 series of standards has been adopted by more than 80 countries and is used as a benchmark for quality management by industry and government bodies worldwide. In some cases, ISO 9000 registration has become a prerequisite for doing business domestically and internationally. In North America, over 13,000 companies are registered to ISO 9000.

The quality management system framework can serve as a foundation for environmental management systems. In essence, an EMS is the application of quality management system principles to the management of environmental affairs. While the ISO 9000 and ISO 14001 standards have different focuses, they share many similar requirements. The three specification documents for ISO 9000 series are ISO 9001, ISO 9002, and ISO 9003. The key difference between ISO 9000 and ISO 14001 is that ISO 14001 requires planning steps to identify environmental aspects and significant environmental impacts which become the basis of continual improvement.

Sustainable Development

In 1987, the World Commission on Environment and Development (**Brundtland Commission**) coined the term "sustainable development" in its report entitled *Our Common Future*. This report emphasized the need to balance environmental protection and economic growth.

In 1991, the **International Chamber of Commerce (ICC)** created the *Business Charter for Sustainable Development*. The ICC Charter is comprised of sixteen Principles for environmental management that foster sustainable development. The Principles in this document include some of the basic elements of environmental management systems.

In 1992, the United Nations Conference on Environment and Development (UNCED) was held in Rio de Janeiro. The conference, also called the Earth Summit (or Rio Summit), resulted in two noteworthy documents -- *Agenda 21* and the *Rio Declaration*. *Agenda 21* is a comprehensive guidance document for sustainable development, while the *Rio Declaration* is a set of 27 principles for achieving sustainable development.

These international initiatives on sustainable development marked the dawning of a new age in environmental protection. The business community worldwide was asked to consider its impact on the environment and to take steps to mitigate that impact.

Private Sector Programs & Public Concern for the Environment

Private sector programs, such as the Chemical Manufacturers Association's Responsible Care[®] program, the Global Environmental Management Initiative (GEMI), and the Coalition for Environmentally Responsible Economies (CERES) Principles (formerly the Valdez Principles), resulted in model codes of conduct that encourage environmental stewardship. In addition, public concern for the environment has provided strong motivation for the development of EMS standards.

National EMS Standards & EMAS

In 1992, the British Standards Institute (BSI) published **BS 7750**, the first national standard for environmental management systems. BSI had previously published **BS 5750** (a quality management system standard in the United Kingdom) which was a significant contribution to the development of **ISO 9000**. **ISO 14001** was largely based on **BS 7750**, and the two standards share many similar requirements. The **BS 7750** Standard, however, is viewed by many to be more stringent than **ISO 14001**. For example, **BS 7750** requires that an organization compile a register of its significant environmental effects, and a register of all legislative, regulatory, and other policy requirements. In addition, **BS 7750** requires an organization to make its environmental objectives publicly available.

Following the publication of the United Kingdom's **BS 7750**, a proliferation of national EMS standards emerged, including standards from Ireland, France, South Africa, and Spain. These various EMS standards did not all share the same requirements, and in some cases the requirements were contradictory. It became clear that in order to facilitate international trade, there would have to be one international EMS standard that would be accepted around the globe.

In addition to the national EMS standards, European legislation was developed. The **Eco-Management and Audit Scheme (EMAS)** was adopted by the European Union (EU) in 1993. EMAS is a regulation that enables industries to voluntarily implement formal environmental management systems in order to improve their environmental performance. While **ISO 14001** and **BS 7750** apply to organizations (or parts thereof), EMAS is restricted to site-specific industrial activities. EMAS participants must prepare an environmental statement specific to each site concerned and provide information to the public about their environmental aspects. Third-party verification of the EMS is an essential component of EMAS. Participating organizations are included on the EU list of participating sites.

The Registration Process

EMS registration is the process whereby a non-biased "third-party" attests that an organization's EMS conforms with the requirements of an EMS standard, such as ISO 14001. It is important to note that the ISO 14001 Standard does not require third-party registration, but market forces and regulatory incentives may provide strong encouragement for registration. The third-party organization that performs the registration services is called a "registrar." The type of registration services that will be offered for ISO 14001 will be similar to those offered for the ISO 9000 series of quality management system standards. In North America, over 13,000 companies have been registered to ISO 9000.

The ISO 14001 Standard does not require that an organization implement the EMS at the corporate level. For example, one organization may choose to implement the Standard throughout the entire organization, while another may implement the Standard in one particular facility. Therefore, an organization can elect to register the entire organization, a division(s), selected facilities, a particular facility, or selected operations within a facility. The key factor in choosing the organizational unit for registration purposes is that it has its own functions and administration.

A registrar can be "accredited" by a third-party accreditation body that is independent of the registrar. **Accreditation** is the process by which a registrar's competence is evaluated by a third-party accreditation body with national or governmental recognition. Accreditation greatly enhances a registrar's credibility.

Registrars may have different registration processes and may offer different types of services. The following description of the registration process is fairly typical of the process used by many registrars. It is provided for illustrative purposes:

Step 1: Application for Registration

The organization that wishes to obtain EMS registration submits an application indicating the activities and facilities of the organization or site to be registered.

Step 2: Review of EMS Documentation / Desk Audit

The organization submits documentation of its EMS, which includes its environmental policy and documentation that indicates how it meets each clause in the ISO 14001 Standard. The documentation is reviewed by a designated lead auditor. The auditor generates a written report which indicates conformance or nonconformance of the documented EMS to each clause of the Standard.

Step 3: On-site EMS Readiness Review

The lead auditor conducts an on-site visit in order to resolve any EMS documentation nonconformances and to verify that the facility is prepared for a full registration audit. The on-site visit is also used to assess the resources and logistics necessary for the full registration audit.

Step 4: Registration Audit

An audit team will conduct an on-site audit to evaluate and verify through objective evidence (interviews, procedures, records, etc.) that the EMS conforms to the requirements in the ISO 14001 Standard, is effectively implemented, and has sufficient provisions to be maintained.

Step 5: Registration Determination

A final report containing the results of the registration audit is submitted to the organization. To receive a Certificate of Registration, an organization must successfully meet the requirements of the ISO 14001 Standard, as well as the registration policies of the registrar.

Step 6: Surveillance

Surveillance audits are typically performed semi-annually to verify continued conformance. During the surveillance audits, the audit team may only audit certain elements of the EMS. Over a three year period, however, all of the elements of the EMS must be reviewed to ensure continued conformance to the requirements of the ISO 14001 Standard.

Registration Audit Results

There are essentially three possible results from a registration or surveillance audit. The registrar can determine that the applicant is:

- 1) Recommended for registration
There are no major nonconformities;
- 2) Recommended for registration following verification of corrective action
There are one or more major nonconformities which can be corrected and verified without a full re-audit; or
- 3) Recommended for an on-site reassessment
There are several major nonconformities which indicate a breakdown of the EMS. Another full on-site audit is required.

Note: A *major nonconformity* is the absence or complete breakdown of an EMS element. A large number of minor nonconformities for one element may be considered a major nonconformity. A *minor nonconformity* is a single observed nonconformity.

Appendix B

Questions Asked of Project Participants at the Conclusion of the Project

- What factors are motivating/driving your company to implement an EMS?
- What have been the barriers/challenges to EMS implementation encountered thus far, and how has your organization addressed them?
- What specific requirements in ISO 14001 are questionable (i.e., unclear, of limited value, or too difficult to implement) and why? Please provide a reference to the actual language when answering this question.
- Has (or will) implementing the EMS helped your organization develop more effective approaches for managing environmental compliance activities?
- Has implementing the EMS improved your organization's overall environmental performance? Which specific environmental impacts have been affected?
- Has implementing the EMS reduced overall environmental management costs? Which costs in particular?
- Has implementation brought or maintained domestic or international trade opportunities? If so, explain.
- In what ways have you integrated your EMS with ISO 9000 or other existing management systems (e.g., health & safety)? Please explain.
- Have you attempted to calculate the costs of EMS implementation? If so, how did you define your implementation "starting point" (i.e., was this project the EMS starting point, or some time before that)? What costs were considered in the calculation?
- What other benefits have you received, or expect to receive, from EMS implementation?
- What advice would you offer to regulators (federal, state) as they look for ways to use the EMS approach and ISO 14001 in their interactions with the regulated community?

Appendix C

Elements of the ISO 14001 Standard: A Snapshot

Environmental policy - Develop a statement of the organization's commitment to the environment. Use this policy as a framework for planning and action.

Environmental aspects - Identify environmental attributes of the organization's products, activities, and services. Determine those that could have significant impacts on the environment.

Legal and other requirements - Identify and ensure access to relevant laws and regulations (and other requirements to which the organization adheres).

Objectives and targets - Establish environmental goals for the organization, in line with its policy, environmental impacts, views of interested parties, and other factors.

Environmental management program - Plan actions to achieve objectives and targets.

Structure and responsibility - Establish roles and responsibilities, and provide resources.

Training, awareness and competence - Ensure that employees are trained and capable of carrying out their environmental responsibilities.

Communication - Establish processes for internal and external communications on environmental management issues.

EMS documentation - Maintain information on the EMS and related documents.

Document control - Ensure effective management of procedures and other system documents.

Operational control - Identify, plan, and manage operations and activities in line with the organization's policy, objectives, and targets.

Emergency preparedness and response - Identify potential emergencies and develop procedures for preventing and responding to them.

Monitoring and measurement - Monitor key activities and track environmental performance.

Nonconformance and corrective and preventive action - Identify and correct problems and prevent recurrences.

Records - Keep adequate records of EMS performance.

EMS audit - Periodically verify that the EMS is functioning as intended.

Management review - Periodically review the EMS with the goal of continual improvement.

Appendix D

Excerpts from NSF's EMS Self-Assessment Tool

This appendix contains two items:

- the first page of the checklist from NSF's EMS Self-Assessment Tool; and
- descriptions of the five implementation levels used in the tool.

These excerpts from the assessment tool are provided here to illustrate the format of the EMS self-assessments and independent assessments that were conducted as part of the EMS Demonstration Project. The sample page taken from the checklist contains the exact language from the ISO 14001 Standard. The actual checklist, which contains EMS requirements from the entire Standard, is approximately nine pages in length.

As discussed in Section IV of the report, the checklist breaks down the 17 elements of ISO 14001 into 63 individual requirements. The sample page provided contains the first eight of these requirements. The numbers that appear with each requirement are not found in the actual Standard; they were developed solely for use in NSF's EMS Self-Assessment Tool.

Checklist for ISO 14001: Sample Page

Requirement	Implementation Level		
	Yes	No	Comments
4.2 ENVIRONMENTAL POLICY			
Top management shall define the organization's environmental policy and ensure that it:			
4.2.1 is appropriate to the nature, scale and environmental impacts of its activities, products or services;	<input type="checkbox"/> COM <input type="checkbox"/> ES	<input type="checkbox"/> NA <input type="checkbox"/> IN <input type="checkbox"/> PAR	
4.2.2 includes a commitment to continual improvement and prevention of pollution;	<input type="checkbox"/> COM <input type="checkbox"/> ES	<input type="checkbox"/> NA <input type="checkbox"/> IN <input type="checkbox"/> PAR	
4.2.3 includes a commitment to comply with relevant environmental legislation and regulations, and with other requirements to which the organization subscribes;	<input type="checkbox"/> COM <input type="checkbox"/> ES	<input type="checkbox"/> NA <input type="checkbox"/> IN <input type="checkbox"/> PAR	
4.2.4 provides the framework for setting and reviewing environmental objectives and targets;	<input type="checkbox"/> COM <input type="checkbox"/> ES	<input type="checkbox"/> NA <input type="checkbox"/> IN <input type="checkbox"/> PAR	
4.2.5 is documented, implemented and maintained and communicated to all employees; and	<input type="checkbox"/> COM <input type="checkbox"/> ES	<input type="checkbox"/> NA <input type="checkbox"/> IN <input type="checkbox"/> PAR	
4.2.6 is available to the public.	<input type="checkbox"/> COM <input type="checkbox"/> ES	<input type="checkbox"/> NA <input type="checkbox"/> IN <input type="checkbox"/> PAR	
4.3 PLANNING			
4.3.1 Environmental Aspects			
4.3.1.1 The organization shall establish and maintain (a) procedure(s) to identify the environmental aspects of its activities, products or services that it can control and over which it can be expected to have an influence, in order to determine those which have or can have significant impacts on the environment.	<input type="checkbox"/> COM <input type="checkbox"/> ES	<input type="checkbox"/> NA <input type="checkbox"/> IN <input type="checkbox"/> PAR	
4.3.1.2 The organization shall ensure that the aspects related to these significant impacts are considered in setting its environmental objectives.	<input type="checkbox"/> COM <input type="checkbox"/> ES	<input type="checkbox"/> NA <input type="checkbox"/> IN <input type="checkbox"/> PAR	

Appendix D

EMS Assessment Checklist Implementation Level Descriptions

Described below are the five implementation levels used in NSF's EMS Self-Assessment Tool. Achievement levels NA, IN, and PAR indicate that the requirement has not been met - this is categorized as "NO" on the assessment checklist. Levels COM and ES indicate that the requirement has been met - this is categorized as "YES" on the checklist.

No Action (NA) - No significant or formal actions have been taken by the organization to plan or implement activities that would meet this requirement.

Initiation (IN) - The organization has begun to plan or undergo specific activities that would contribute to fulfilling this requirement. Activities might include one or more of the following:

- general planning has begun or been assigned;
- a written action plan or outline is prepared, or being prepared;
- draft policies, procedures or initiatives are under development or review;
- responsibilities for specific planning or design activities have been assigned; or
- pilot activities to assist in the design process are underway.

Partial Implementation (PAR) - Implementation of an action plan has begun, but major gaps in implementation exist in the organization. Specific activities that contribute to fulfillment of this requirement have been implemented in only *parts* of the organization; and/or some *but not all* of the necessary activities have been implemented; and/or activities are fully deployed but are *not implemented effectively*.

Complete Implementation (COM) - *All* specific activities necessary to fulfill this requirement have been *effectively* implemented in *all* parts of the organization.

Evaluated & Sustained (ES) - Specific policies, procedures, or activities that contribute to fulfillment of this requirement have been reviewed and evaluated, and improvements, where appropriate, have been introduced. Activities have been documented, sustained over time (e.g., one full business cycle), and have been fully integrated into routine business operations.