Spring 5-31-1997

Assessment of potential operating benefits incurred by implementing ISO 14001 : five case studies from the New Jersey Chemical Industry

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ABSTRACT

ASSESSMENT OF POTENTIAL OPERATING BENEFITS INCURRED BY IMPLEMENTING ISO 14001: FIVE CASE STUDIES FROM THE NEW JERSEY CHEMICAL INDUSTRY

by
Stefanie Gitter

Environmental management is an important aspect of strategic planning and competitiveness for many businesses. Environmental management systems (EMS) are operating policies that are established to help a company measure progress towards goals set forth in a strategic environmental plan. A growing number of EMS models are being used by countries and industry groups, so the International Standards Organization (ISO) developed one model to prevent duplicate efforts which can result when companies try to meet the import requirements of different countries.

The ISO-EMS model is a series of standards, and ISO 14001 is the first to be published. Companies will be driven to implement the standard by two factors. One is external, such as meeting customer demand or import requirements. The other factor is acknowledgment of internal benefits reaped, such as cost reductions, increased understanding of the environmental impacts, reduced hazardous emissions, implementation of pollution prevention activities, better regulatory compliance record, and an improved relationship with community members. The purpose of this study was to determine if the study population would benefit from implementing an ISO-EMS, and the findings were that these companies would not.

ASSESSMENT OF POTENTIAL OPERATING BENEFITS INCURRED BY IMPLEMENTING ISO 14001: FIVE CASE STUDIES FROM THE NEW JERSEY CHEMICAL INDUSTRY

by
Stefanie Gitter

A Thesis
Submitted to the Faculty of
New Jersey Institute of Technology
in Partial Fulfillment of the Requirements for the Degree of
Master of Science in Environmental Policy Studies

Department of Humanities and Social Sciences

May 1997

APPROVAL PAGE

ASSESSMENT OF POTENTIAL OPERATING BENEFITS INCURRED BY IMPLEMENTING ISO 14001: FIVE CASE STUDIES FROM THE NEW JERSEY CHEMICAL INDUSTRY

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This thesis is dedicated to all of my editors.

ACKNOWLEDGMENT

The author is grateful to the environmental managers at the case study companies. Without their particpation and the information they provided, this project would not have been possible.

The author wishes to thank all those who have assisted with the research, especially the advisor Dr. Lange. Thanks to Dr. Lederman and Dr. Kirchhoff for serving as members of the committee and assisting in the refinement of the thesis.

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CHAPTER 1

INTRODUCTION

1.1 Problem Statement

It is unclear if and how United States facilities can benefit from implementing the International Organization for Standardization's (ISO) new series of standards on environmental management (ISO 14000). Most facilities already have some type of environmental management system in place; thus, the purpose of this study is to determine whether facilities can achieve further benefits with the ISO standard than those provided by their current programs. In order to understand the potential benefits associated with this new standard, the benefits of an environmental management system and an international standard must be considered.

There are clear benefits to having an environmental management system, the part of the overall management scheme that addresses the environmental impacts of a firm's products, processes and services on the natural environment. One benefit is the ability to identify opportunities for substantial cost savings (Hart and Ahuja, 1996; Dorfman, Muir and Miller, 1992). Other benefits of an environmental management system are described in a report by the New Jersey Department of Environmental Protection (NJDEP), which indicated that many companies reduced the number of regulations they had to follow by changing processes or substituting inputs with less hazardous materials. The report also stated that companies gained a better understanding of facility chemical usage, waste production and the associated costs; additionally, some companies' product pricing was

adjusted to reflect this gained understanding. Further, some companies were able to reduce the number of permits needed (Office of Pollution Prevention, NJDEP, 1995).

There are also clear benefits to having international standards. By replacing multiple national standards with a single international standard, trade barriers are reduced and efficiency is improved. The acceptance of ISO 9000, a voluntary series of quality standards, which have become "almost a condition for doing business through the world" (Barnes, 1996), demonstrates that process standards (such as ISO 14000) are as important to international trade as product standards. Voluntary process standards without performance requirements are being viewed as an improvement upon existing regulatory programs[1].

Despite the individual benefits of environmental management systems and international standards, it is still not clear if there are benefits associated with an initiative that combines these two types of programs, as has been done by creating ISO 14000. Since few companies in the United States have implemented this new standard, there is too little experience with it for managers to make an informed assessment of its benefits. This thesis is designed to address the potential benefits of implementing this new ISO standard for United States facilities.

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[1] Even some regulators are claiming that it could affect how facilities are regulated by state and federal agencies (Barnes, 1996).

1.2 Overview

This thesis will address the potential benefits of implementing the International Organization for Standardization (ISO) Series of Environmental Management Standards by using a case study approach. The environmental management systems of five New Jersey chemical companies were assessed and compared to the environmental management system described by the international standard. Interviews with the environmental managers at these facilities were conducted to determine the benefits of the current environmental program. Then analysis was performed to determine whether these companies would further benefit from implementing the ISO-EMS, or if the facilities had already achieved all of the potential benefits of implementing the standard through its current program.

Chapter Two defines and states the purpose of standards. It discusses the benefits of international standards from three perspectives: developing countries, multinational corporations and consumers. Environmental management systems are defined, and elements included in various models are listed. There is also a discussion of how standards and environmental management systems have been combined to form the ISO Series of Environmental Management Standards. Potential benefits of the standard and concerns regarding implementation of an ISO-EMS are then addressed.

Chapter Three reviews the relevant empirical literature about the benefits and obstacles to implementation of an ISO-EMS. Current studies that use various methods to evaluate environmental management systems are presented. Studies which evaluate the significance of reactive (those which react to regulatory requirements and major events) or

proactive (those which are motivated by the desire to improve efficiency and competitiveness) environmental management systems are also discussed. Literature on ISO 14000 is reviewed.

Chapter Four describes the study population, circumstances pertaining to the population which may affect the outcome of the study and explains the methodology used to select companies for the study population. A discussion of the research methods used and the interview instrument follows. A brief description of the study participants is given in this chapter as well.

Interview results are found in case study format, in Chapters Five through Nine. Each case study presents information about how environmental decisions are made at the facility. Each facility's current environmental management system is compared to ISO-EMS requirements. Answers to interview questions regarding results of current environmental management systems implementation are then presented. An analysis section is included to review and determine if additional benefits would result from altering the current environmental management system to an ISO-EMS.

The concluding chapter provides a summary of the ideas presented throughout the thesis, a comparison of the case studies results and conclusions. Policy implications and areas for future study are also included in this section.

CHAPTER 2

CONCEPTS AND THEORY

The desire of corporations to improve environmental performance has been accompanied by a proliferation of scientific and management programs addressing corporate environmental performance. Individual companies, industry groups, regional and national governments have each developed environmental management programs, which overlap in scope and goals. Upon recognizing this overlap, the International Organization for Standardization (ISO) established a committee whose purpose was to determine if an international standard "could serve to promote a common approach to environmental management" (Crognale, 1995). This committee's recommendation resulted in the ISO 14000 Series of Environmental Management Standards. In order to fully grasp the significance of an international standard for environmental management, certain concepts must be understood. These concepts, which will be discussed in this chapter, are: the purpose of standards, the benefits of international standards from various perspectives, the theories behind and components of environmental management systems. Also included in this chapter is a description of ISO 14000 and the projections pertaining to which companies could benefit from implementing an ISO-EMS.

2.1 Standards

A standard is a document containing a set of conditions or a description of a fundamental unit (Sanders, 1972), the use and substance of which have been formally or informally

agreed upon by a community. The metric system is an example of a formally agreed upon standard. Safety standards, such as standard positioning of headlights and seat belts in automobiles, are other types of formally agreed upon standards. Standards may be developed to improve communication among people, as well. For example, technical communities may use jargon to prevent confusion caused by language barriers. Market forces or the superiority of a specific product may result in an informally agreed upon standard. For example, the Chrysler Corporation introduced the minivan. It quickly became the standard for all minivans, because of the popularity of the initial model (Blow, 1995).

The primary purpose of developing standards for industry is to improve the overall economy of human effort, as it relates to producing goods and their trade (Sanders, 1972). By documenting an established method for accomplishing a task, humans are able to capitalize on lessons already learned (Sanders, 1972). In other words, once there is an established and documented method for accomplishing a task, there is little reason for others to duplicate this work. Another purpose of standards is to ensure that different products can work together. For example, computer monitors and computers are compatible, even if made by different companies. Also, parts that make each product work are made to documented specifications, making replacements easier when needed. Finally, standards can reduce variables in production which can simplify processes and prevent mistakes.

2.2 International Standards

International standards are standards that have been drafted and agreed upon by nations around the world. The ISO is the organization responsible for this task; it is made up of one national standards body per nation, from over 110 nations. This section will discuss the purpose of international standards and their benefits from the perspectives of developing countries, multinational corporations and consumers.

International standards are designed to remove trade barriers. Many countries have legal requirements to which imported goods must adhere; however, if these are different from the standards of the exporting country, there may be a trade barrier. International standards eliminate the need for corporations to produce variations of their products for sale in different countries. A single standard allows them to manufacture one product which improves efficiency and overall costs. Except in cases where the international standard does not address certain local needs or safety requirements, international standard requirements will be considered acceptable by the importing country (Sanders, 1972).

Peoples of developing countries are often aided by international standards. Standards communicate specifications and technical expertise that allow the manufacture of goods. Without standards to give this detailed information, peoples of developing countries would not have access to it; nor would they have the resources to devote to determine the information for themselves. It is this information that allows them to produce many products. Also, manufacturing their products to the specifications of an

international standard gives the products from developing countries credibility with consumers, who might otherwise doubt the product quality (Sanders, 1972).

Multinational corporations support the promulgation of international standards because they provide a means of self-regulation. Many such corporations want to regulate themselves through industry-wide initiatives and other voluntary programs, because mandatory international policies may be technically difficult to execute and may be inappropriate for all industries or locations. Also, international policies are not enforced uniformly. For these and other reasons, these policies are often challenged[2]. Voluntary initiatives are welcomed by corporations because they provide more freedom in developing methods to accomplish objectives than regulatory programs. It also costs less to implement voluntary initiatives than regulatory ones. One analysis by DuPont shows that regulatory work can cost up to three times more than voluntary measures to achieve the same results (Schmidheiny and Zorraquin, 1996). Voluntary programs took much less paperwork and time to accomplish the same results. This analysis also illustrated that the firm chose more effective methods of achieving results than those prescribed by regulation.

Consumers also benefit from international standards. If a product is designed to the specifications of an international standard, the consumer is guaranteed a certain level of quality. Products following the guidelines of an international standard can be compared to similar products manufactured by different companies, thus making comparison

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[2] For a detailed discussion of weaknesses in international law and its impacts on transnational corporations, see Fowler, 1995.

shopping relatively easy for consumers (Sanders, 1972). Consumers also have more choices because they can choose from virtually any manufacturer, not just the few whose products meet their country's import requirements.

2.3 Environmental Management Systems

ISO 14000 is a series of international standards that address environmental management, and the first standard in the series gives specifications for environmental management systems. Environmental policy statements are being incorporated into the strategic management plans at many corporations. Environmental management systems have grown out of companies' formal policy statements that describe the objectives of their environmental programs. Policy statements may include environmental performance targets or allocations of financial and human resources to specific projects within an overall environmental program (Ledgerwood, Street and Thrievel, 1994). Policy statements must be put into action by a set of operating policies and procedures which plan for, measure progress towards, and revise environmental goals and objectives.

An environmental management system (EMS) is this set of operating policies. An EMS may consist of one, all or any combination of the following elements: planning, organizing, guiding and directing, communicating, and controlling and reviewing (Greeno, Hedstrom and DiBerto, 1985). Another element included in many EMS models is the goal of continuous improvement. See Figure 1, a general EMS model.

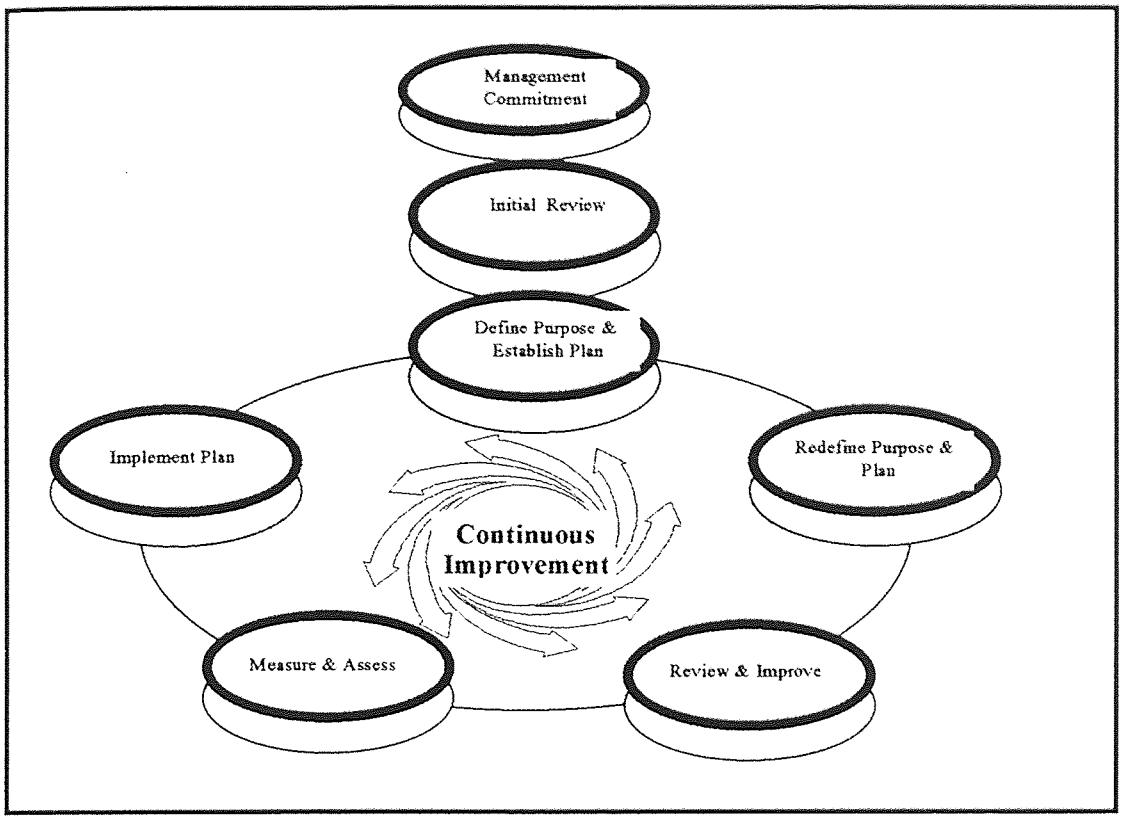

Figure 1 General model for environmental management systems[3]

The goal of continuous improvement is a part of the ISO-EMS standard requirements, and is an important part of many other EMS models. The goal of continuous improvement stems from the philosophy of quality environmental management. This approach encourages an integrated approach to reducing pollution through small, incremental improvements which are constantly being implemented (President's Commission on Environmental Quality, 1993). This approach to environmental

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[3] This model is adopted from Consoli, 1995.

management moves "up the pipe," rather than relying upon end-of-pipe pollution controls[4].

Pollution prevention is another integral part of many EMS models. Pollution prevention activities are often initiated as a result of information provided by an EMS. These activities are also often the primary method employed to achieve the benefits of an EMS. They are often undertaken voluntarily in order to improve process efficiency. A firm may be able to stay ahead of new regulations as a direct result of implementing these activities (Epstein, 1996). Pollution prevention activities are small, incremental improvements that often have relatively short pay back periods (Hart and Ahuja, 1995), as opposed to end-of-pipe controls, which can have much higher start-up costs and require larger rates of return on investment. In contrast, end-of-pipe controls are often implemented because of new regulations.

Companies benefit from having an EMS in place because they have an organized system for gathering information about their processes which can result in cost savings, improved regulatory compliance, improved environmental performance and efficiency.

As stakeholders realized companies could attain these benefits through use of an EMS, they began to develop the early models. For example, various industry groups (such as the Chemical Manufacturers Association), and citizen groups (such as the Coalition for Environmentally Responsible Economies) developed their own environmental management programs. In response, individual countries developed

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[4] End-of-pipe pollution controls are a type of technology that mitigates pollution after it has been created, before it is released into the environment. Technologies that have moved "up-the-pipe" prevent pollution.

national environmental management system standards. Therefore, companies that desire international trade not only have to be certified according to their home country's requirements (if there were any), but also according to the standards of each country in which the company wishes to conduct business.

2.4 International Standard on Environmental Management (ISO 14000)

2.4.1 Development and Description of the Standard

The proliferation of national environmental management standards among member countries of the European Union and the volume of international trade among European nations, resulted in the European Union drafting the European Union Eco-Management and Audit Scheme (EMAS). It was designed to "bridge the gap" among the national programs. Shortly after EMAS was implemented, the ISO began developing a series of international standards which would be recognized by all countries. The ISO series of standards addresses a range of topics from environmental management systems to environmental auditing and labeling, see Figure 2. The standard addressing environmental management systems is known as ISO 14001 (referred to as the ISO-EMS requirements in this document), and is the only standard which has been approved by the ISO voting body to date, (see Figure 3 on the next page for ISO-EMS requirements). One aspect of the ISO-EMS which sets it apart from other EMS is that it is certifiable by third party auditors. This gives companies who claim to have the best practices in place a way to verify that claim.

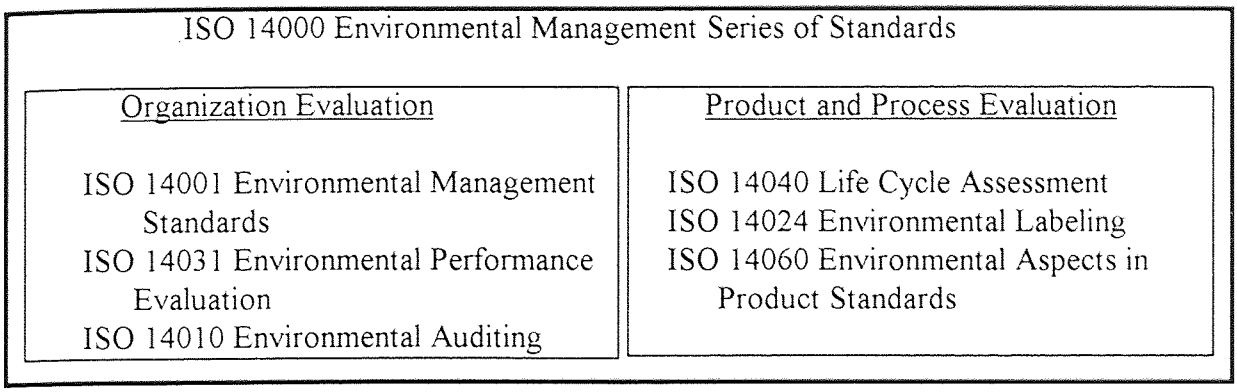

Figure 2 ISO 14000 series of standards under development

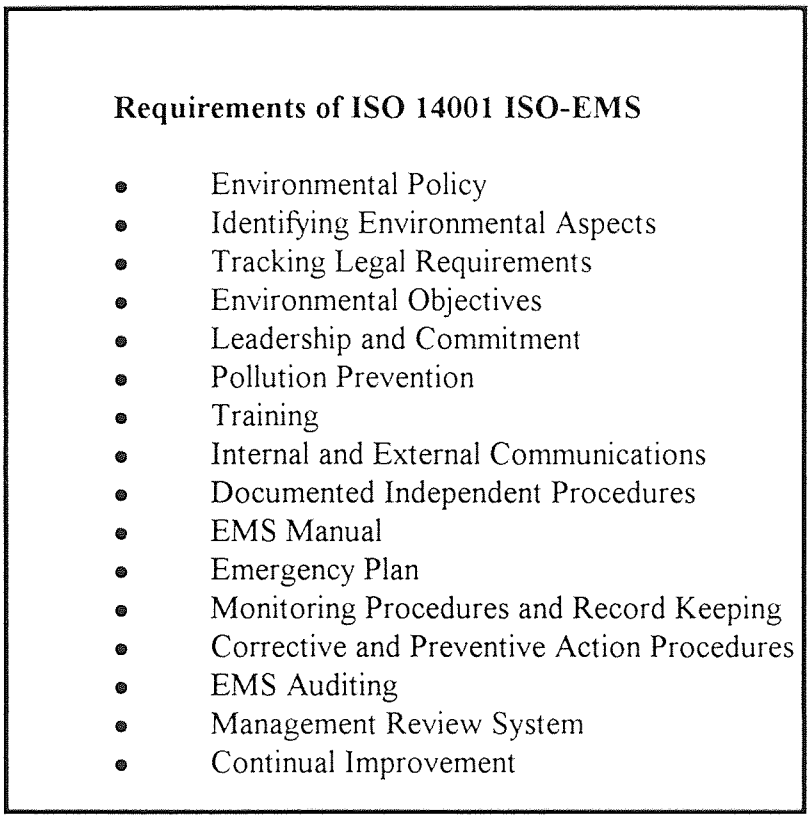

Figure 3 Requirements of ISO-EMS

2.4.2 Benefits of Implementing the Standard

Decisions to implement the standard will be affected by two types of forces, each of which have their own set of benefits. These benefits are listed in Table 1 and are discussed in the following pages.

Table 1 List of potential benefits from implementing an ISO-EMS

Benefits To Implementing An ISO-EMS	
Resulting From External Pressure	Resulting From Independent Reasons
Satisfying Customer Demands	Improved Understanding of Environmental Impacts
Meeting Import Requirements	Cost Savings
Improved Public Image	Reduced Hazardous Emissions
Improved International Competitiveness	Increased Number of Pollution Prevention Activities
	Improved Compliance Record
	Improved Relationship with Community and Regulators
	Decreased Liability

External forces are the first type of driving factors which affect firm decision to implement the standard. External forces include meeting customer demands for environmentally sound products; environmental requirements set forth by importing countries; stockholder concerns about public image. The following paragraph describes the potential external benefits associated with implementing an ISO-EMS.

First, implementing an ISO-EMS may result in satisfying existing customers or, in cases where competitors have not yet implemented the standard, gaining new customers. Second, if large companies and government organizations make ISO-EMS certification mandatory for suppliers and contractors[5] (Cascio, 1995), as many are expected to do, having an ISO-EMS in place can provide a competitive advantage. Even if a customer does not specifically require an ISO-EMS, it can be a competitive advantage since many American businesses want to avoid implication in legal proceedings arising from environmental abuse where joint liability exists. Third, meeting import requirements would also allow maintenance or development of a presence in countries which require the standard. Fourth, stockholder concerns about public image and liabilities would be mitigated by implementing the ISO-EMS, because it is certified by a third party.

If external pressures are exerted, then the standard could provide competitive advantages in the global market; however, no company, government, or major shareholder has made the standard a requirement yet.

Firms may find reasons, other than the external benefits just described, to implement the standard. These reasons may include the desire to improve process

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[5] The United Kingdom Office of Defense has already expressed such an intention.

efficiency and improve the current environmental management system's effectiveness. These will be referred to as internal benefits from this point forward. Many of these internal benefits overlap with the benefits of any effective EMS, as described in the previous section; however, other models may not be as comprehensive as the ISO-EMS model and therefore may result in fewer benefits. The following paragraph describes the potential internal benefits associated with implementing an ISO-EMS.

First, employees may improve their understanding of environmental impacts of production, by being involved in the process of developing an EMS. This improved understanding may result in process improvements, product improvements, change in purchasing patterns of hazardous chemicals or reduced consumption of natural resources. Second, costs savings may be incurred as a facility discovers ways to improve process efficiency or reduce costs of disposal of wastes and byproducts. Third, implementation of the standard may provide information which will lead to a reduction in hazardous emissions and the implementation of pollution prevention activities. It may also lead to better tracking of regulatory requirements and reduce violations. Fourth, it may lead to increased communication with members of the community and regulators, thereby improving those relationships. Fifth, a firm may also be able to reduce their own liabilities by implementing the ISO-EMS. Insurance costs may be reduced by demonstrating dedication to an environmental program (Freeman, 1995). Insurance companies are evaluating their customers for environmental liabilities and often reward them when reductions occurs. Thus, it follows that implementing a program which is geared toward reducing environmental liabilities and uses third-party audits could be used as the proof

required by insurance companies and stock evaluators, something a growing number of investors are requiring (Investor Responsibility Research Center, 1992). Banks are also more willing to lend to companies with few liabilities, so they too may use the standard as criterion for lending. The ISO-EMS may be the best model for this use because it is internationally recognized.

2.4.3 Concerns Raised About the Standard

Environmental managers have identified many benefits to implementing an ISO-EMS, but their concerns about the standard may prevent implementation. The foremost concern is the cost of certification. According to Cornelius C. (Bud) Smith, Jr., the Director of Environmental Management Services at ML Strategies (a national auditing firm), the costs range between $10,000 to $25,000 (Smith, 1996), depending on the amount of auditor time required; size of the organization; number of facilities being certified; and if it is a joint ISO 9000 certification. The competitive advantage of certification may not justify these costs.

Another concern is that given the cost of certification, the ISO-EMS may give unfair advantages to large companies, who can easily absorb the certification costs and may have staff with the expertise needed to implement the ISO-EMS. Small companies may not be able to absorb these costs and they may lack the required expertise, resulting in the additional costs of outside consultants (Haveman, 1995).

A related concern is that the standard requires pollution prevention as a goal of an EMS, but does not specify how to accomplish pollution prevention. Unless technical

assistance programs or other methods are used to provide this expertise, the ISO-EMS standard may eliminate small businesses from areas of competition. Although one inherent goal of drafting the standard was to "level the playing field," it may accomplish the opposite result.

Another area where the playing field has not been leveled is the ISO requirement of compliance with all local laws. This is the only element of the ISO-EMS which suggests environmental performance levels. However, since laws differ among regions and countries, those companies in locations with strict laws are at a disadvantage (Porter, 1995). Also, enforcement activities vary by country. It may be difficult to determine if some facilities are in compliance with local laws because there are virtually no enforcement programs.

Another criticism of the standard is that it has no guarantee of environmental performance improvements. Although continuous improvement is an element of the ISO-EMS, minute improvements satisfy this requirement. Without performance level requirements, there is little chance of actually improving environmental performance (Porter, 1995). In contrast, those firms that have already made much progress in improving their environmental performance may reach the point of diminishing returns; the costs of making slight improvements may not be economically efficient.

There are also concerns that implementation of the standard could actually increase liability. Certification requires documentation that may not have previously existed. This documentation could be used against a firm by regulators, toxic tort plaintiffs or others (Freeman, 1995). Also, while third-party auditors will be aware of any violations --

whether or not they would report them is unclear. If they do not, they may still be forced to discuss them during legal proceedings (Freeman and Belcamino, 1995).

Predictions can be made about how the ISO-EMS will be used by companies in the United States based upon this discussion of the potential benefits and areas of concern.

2.5 Projections of which Companies Could Benefit by Adopting an ISO-EMS

Considering the potential benefits of implementing this standard and experiences with other standards, it is clear that ISO-EMS certification may be worthwhile for some companies, but not others. This section will discuss combinations of characteristics which would affect how a firm could benefit from implementing the standard. It is important to understand that some characteristics which might lead to benefits might also be those which inhibit a firm from implementing an ISO-EMS. For example, a firm with a reactive EMS may benefit from implementing an ISO-EMS, but a corporate culture that is satisfied with a reactive EMS might not be willing to commit to, or see a need for, an ISO-EMS. Table 2 provides a list of individual characteristics which may affect the benefits a firm may achieve from implementing an ISO-EMS.

In theory, most large multinational companies have an incentive to support the widespread adoption of international standards, as discussed above. However, the incentives for supporting the ISO-EMS standard have to be strong enough to offset the costs of implementing it. Such incentives could include improving the compatibility of a company's plants in different countries and a level of environmental management that would hold up under international scrutiny. For companies that export products, the

incentive is that the standard is international, meaning it would be accepted by all countries. Companies with partners outside of the United States would benefit because the standard is recognizable around the world. It could provide an instant definition of a compatible environmental management program. A company without an EMS, or a company whose EMS is not functioning well, would benefit from implementing an ISO-EMS because they would be implementing a state-of-the-art model, which was designed by experts. Companies that have had environmental image problems or that faced fines or lawsuits would benefit by having the credibility which comes from an EMS that was certified by a third party. Large facilities or companies may benefit from having an all-encompassing EMS which manages all of the environmental impacts of operations, instead of various overlapping programs or a piecemeal approach that has holes.

Any company which has a suitable EMS in place and/or conducts little to no business in the global marketplace is not expected to benefit from implementing an ISO-EMS, based on the concepts presented in this chapter. Also, small companies that lack the expertise and resources to implement such an EMS might incur greater hardship than benefit from this undertaking. Companies with well-established client bases might not be affected by the competitive pressure to implement the standard that other firms might feel, either because they offer a highly specialized product or have strong rapport with

Table 2 Facility characteristics which may affect benefits

Facility Characteristics Which May Affect Benefits of Implementing ISO-EMS	
More Likely to Benefit	Less Likely to Benefit
Manufacturing Industry	Service Industry
Large Company	Small Company
Large Facility	Small Facility
Relaxed Regulatory Oversight	Strict Regulatory Oversight
Poor Compliance Record	Good Compliance Record
Good Experiences with Past Standards and Voluntary Initiatives	Bad Experiences with Past Standards and Voluntary Initiatives
Highly Competitive Market	Specialized Niche
Much International Trade	Little International Trade
International Partners/Facilities in Many Countries	National Partners/Facilities in Single Country
Past or Outstanding Liabilities	Limited Liabilities
Stockholders	Private Company
Stagnant Corporate Culture	Progressive Corporate Culture
Reactive Current EMS	Proactive Current EMS
Poor Public image	Good Public Image

customers. Firms that are part of the service industry would not be expected to implement the standard, because they have no need for an EMS.

This thesis will present case studies of companies with some combination of the various features discussed here to determine if these predictions about who will benefit from implementing the standard are accurate.

CHAPTER 3

EMPIRICAL LITERATURE REVIEW

The following section describes the existing literature on environmental management systems. The benefits of the EMS described in the Chapter Two are reviewed in the first part of this chapter. The second section of this chapter summarizes studies which prove that a proactive EMS may be more likely to achieve the benefits of an EMS than a reactive EMS. The third section reviews company experiences with the ISO Series of Environmental Management Standards.

3.1 Literature on Environmental Management Systems

Most manufacturing companies have environmental management systems in place; many do not resemble the ISO-EMS or other popular EMS models but nonetheless address the effects of production on the natural environment and regulatory requirements. A survey of existing empirical literature reveals there is no standard, all-encompassing method of measuring the effectiveness of an environmental management system, so it is difficult to evaluate (Piasecki, 1995). Audits may evaluate environmental management systems, but do not provide data about their effectiveness or how a company has benefited from having the EMS. The literature suggests methods of measuring environmental performance, but these do not measure the effectiveness of an EMS. These methods include: benchmarking (comparing one program to another which is considered "best in class"); tracking compliance records; accounting for all costs attributed to environmental health

and safety programs; recording emissions to all media by year; and following use of renewable and nonrenewable resources (Greeno, 1994).

Although there are other suggested methods to measure EMS performance, most of the literature on environmental management uses narrative to document case studies. The body of work identifies companies who have made great strides in achieving the goals established by their environmental policy statements. Although these studies do not measure EMS performance, they provide insight into characteristics of effective EMS. The most thorough of these studies which highlight "best practices" in the field of environmental management in the United States was done by Marc Epstein for the Institute of Management Accountants. It examined the environmental management programs of over 100 US companies and conducted extensive interviews with staff at more than 30. His study indicated that while many companies have aggressive environmental policies and strong environmental management systems in place, no company has a "complete system for effectively, identifying, measuring, monitoring, reporting and managing environmental impacts" (Epstein, 1995). Other compilations of case studies which present "best in class" EMS are by Business International Corporation (1992), Ditz, Rangathan and Banks (1995), Piasecki (1995) and Schmidheiny (1993). The Ditz book addresses accounting practices in conjunction with a facility's EMS. Other studies relate the EMS at specific companies to reductions in hazardous emissions, non-hazardous waste generated and programs initiated to change corporate culture.

A study by INFORM (Dorfman, Muir and Miller, 1992) tracked source reduction activities at 29 chemical companies in three states. This study examined both the elements

of an EMS which resulted in source reduction activities and the cost savings that resulted from these activities. The study indicated that companies with environmental programs which include one of the following features -- cost accounting, employee involvement and leadership -- had more pollution prevention activities than those without them. Additionally, large plants reported more waste minimization than small facilities. Out of 181 pollution prevention activities reported in this study, only one had a net increase in costs. Fifteen percent (of companies for which capital cost saving information was available) reported savings of $1 million or more annually, and nearly half (of companies for which capital cost saving information was available) reported savings between $45,000 and $1 million annually.

Stuart Hart and Gautum Ahuja (1996) tested pollution prevention efforts for cost savings and rates of return on investments among 127 companies found on Standard and Poor's 500 list[6]. Their results indicate pollution prevention does result in significant cost savings. While it often took five years or longer to realize financial gain from pollution prevention efforts, indications of such gains appeared as early as within one year of implementation.

Since New Jersey's pollution prevention program requires companies to plan an EMS, the state has evaluated the effects of EMS planning at regulated companies. Results of this evaluation can be found in "Early Findings of the Pollution Prevention Program" (Office of Pollution Prevention, NJDEP, 1995). This document reports that of the 42

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[6] Pollution prevention is not the only method used to improve environmental performance, used in combination with an EMS, but it is the one most frequently used. Refer back to the discussion on quality environmental management in Chapter 2 for further explanation.

companies visited, 29 (69%) anticipated significant cost savings by using materials accounting and other required techniques. Another benefit this study revealed was that companies reduced the number of regulations they had to follow (no number of facilities is reported).

3.2 Benefits of Proactive EMS

Studies reveal that environmental managers' perspectives on environmental issues significantly affected EMS design and environmental performance. A study by the Danish Environmental Management Survey concluded that environmental performance is weaker when managers view environmental issues as a liability. Correspondingly, environmental performance is stronger when managers view environmental issues as opportunities for improving efficiency and competitiveness (Madsen and Ulhoi, 1996).

These conclusions are supported by a recent study in New Jersey (Thorton, 1996) that focuses on facility commitment to pollution prevention. It found that firms with below average commitment to pollution prevention are driven by regulatory requirements. A study performed for the United Nations indicated that regulations were the biggest influence on the EMS at multinational corporations. According to the study, the second leading factor shaping EMS were reactions to accidents resulting in significant environmental impacts (Kolluru, 1994). EMS which are designed to be proactive may be more likely to achieve the benefits of an EMS than those which are reactive by design.

3.3 Literature on ISO 14000

Few companies have experience implementing an ISO-EMS because the standard has only recently been passed, and the rest of the standards in the ISO 14000 series are still being developed. Those companies who have adopted the standard are still in the process of implementing it, and have not yet drawn any conclusions about their experiences. Thus, there is little literature on the topic of ISO 14000, except literature which describes the requirements of the new series of standards.

The only other literature on this topic describes polls taken of corporate leaders and environmental management experts about the expected use of ISO 14000 in the United States. These polls often report conflicting opinions. Some polls report that corporate leaders interviewed believe the standard will significantly affect how they conduct business in the near future; in contrast, other polls report that the new standard will significantly affect their business only if customers demand it or regulators promote its use. At this point there is little evidence that either of these circumstances will arise (Barnes, 1996).

One poll of 500 companies certified to ISO 9000 reported 77 percent of the 123 respondents had an EMS in place, but half of those were not as comprehensive as the ISO-EMS. Thirty-nine percent of respondents stated they planned to implement the standard within one to three years; another 34 percent replied they would wait to see how use of the standard develops before initiating its implementation (Hadlet, 1995).

An interview conducted with an employee of an ISO certified auditing company indicated that many companies are expressing an interest in the standard, but few are

actively seeking certification[7]. Although the standard is only expected to impact manufacturers, this interview revealed that both manufacturers and the service community have expressed an interest in it.

At this point there is too little information regarding the benefits of an ISO-EMS to determine the role it will play, without external pressures being exerted on firms based in the United States (described in previous chapter). Companies may best benefit by augmenting their existing EMS with the requirements of an ISO-EMS, but refraining from the certification process until absolutely necessary.

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[7] Employee and company wish to remain anonymous.

CHAPTER 4

STUDY DESIGN

This chapter describes the study population, characteristics of the study population which may affect the outcome of the study, the research method, interview instrument, and description of study participants and expected outcomes.

4.1 Study Population

Participants in this study are facilities which are classified as Standard Industry Code 28, chemical and allied products. The state of New Jersey was selected for this study. Although it has tough environmental regulations (Dorfman, Muir and Miller, 1992), it is improving upon the old programs with new approaches to environmental protection. The new approaches use "holistic" policies which promote pollution prevention and regulatory flexibility. The chemical industry has often been considered the nation's largest polluter, but has made the greatest strides to improve its performance levels in recent years (Office of Pollution Prevention and Toxics, United States Environmental Protection Agency, 1993). It is also the largest employer in the manufacturing sector in New Jersey, "providing more than 20% of all jobs" ("Chemical Industry Finds Change and Cooperation in New Jersey"). Thus this study population, New Jersey's chemical manufacturers, has EMS which most closely resemble an ISO-EMS. Therefore, if these companies can benefit from its implementation, then it follows that other populations would as well. However, if these companies will not benefit from its implementation, then companies

with less stringent environmental management program requirements could still benefit from ISO-EMS implementation. This would be a topic for further research.

Facilities for this study were chosen to represent the different sizes and combinations of sizes of facilities within companies which represent New Jersey's chemical industry. For the purposes of this study, companies will be classified as large or small according to their Chemical Industry Council of New Jersey classification. All companies will remain anonymous.

Study sampling was taken from the list of companies regulated under the New Jersey Pollution Prevention Act (New Jersey ST 13:1D-41, 1990). From this list, a smaller sample was then necessary. An advisor for this project reviewed the list of companies and highlighted those large facilities/companies which he knew to have well-documented environmental programs. Well-documented environmental programs were most suitable for this study. Facilities, from this revised list, were then randomly asked to participate in this study. Small facilities/companies were chosen at random, based upon willingness to participate. The researcher contacted between 10 - 20 facilities before finding the three small facilities/companies included.

4.2 Circumstances Pertaining to Study Population which May Affect Outcome

There are two factors particular to this study population which may affect the outcome of this study. First, the Chemical Manufacturers Association requires its members to implement the codes of conduct and independent policies which compose Responsible

Care®. The codes of conduct address the following areas: community awareness and response, distribution, process safety, pollution prevention, employee health and safety and product stewardship. See Appendix A for a more detailed description of these codes of conduct. Over 100 operating policies accompany these required codes of conduct, which shape the EMS at many facilities. Responsible Care® has shaped the EMS at some chemical companies. Without this program, these companies stood to gain significantly more benefits with ISO-EMS implementation. Four of the five study participants are members of the Chemical Manufacturers Association and have Responsible Care® programs in place.

The second characteristic which may affect the outcome of this study is that all of the participants are regulated under the New Jersey Pollution Prevention Act (N.J. ST 13:1D-41, 1990). The New Jersey Act, like the federal Pollution Prevention Act of 1990 (42 U.S.C. 13101-13109 1990), encourages source reduction as the primary method of managing waste. Additionally, the New Jersey Act requires facilities to undertake a rigorous analysis of their processes and products for pollution prevention planning. The Act also recommends, but does not require, the facility to implement many elements required by an ISO-EMS, such as environmental policy statements and leadership roles.

Furthermore, the New Jersey Act requires the same type of documented monitoring and measurements of processes required by an ISO-EMS. The New Jersey planning process may have encouraged managers to rethink their environmental plans and upgrade their EMS. These improvements may have resulted in the same benefits expected

of ISO-EMS implementation, and therefore the facilities may not be as likely to benefit from implementing the standard as facilities not governed by this Act.

Responsible Care® and the New Jersey Pollution Prevention Act (N.J. ST 13:1D-41, 1990) may have shaped the current EMS at facilities included in this study. This implies that these companies would have EMS in place which closely match the required elements of an ISO-EMS, and may have already achieved all of the potential internal benefits of an ISO-EMS. See Table 3 (next page) for a comparison of ISO-EMS requirements to those of the Responsible Care® program and the New Jersey program. These two influences upon facility EMS may make study population companies less likely to implement an EMS in order to achieve the internal benefits described earlier (see Table 1).

Table 3 Comparison of ISO-EMS requirements to New Jersey pollution prevention requirements and Responsible Care®

Comparison of ISO-EMS Requirements to NJP2 Act		
Element of ISO-EMS	New Jersey Pollution Prevention	Responsible Care®
Environmental Policy	YES	NO
Identifying Environmental Aspects	YES	NO
Tracking Legal Requirements	NO	YES
Environmental Objectives	YES	NO
Leadership and Commitment	YES	NO
Pollution Prevention	YES	YES
Training	NO	YES
Internal and External Communication	NO	YES
Documented Independent Procedures	NO	YES
Emergency Plan	NO	YES
Monitoring Procedures and Record Keeping	YES	YES
Corrective and Preventive Action Procedures	NO	NO
EMS Auditing	NO	NO
Management Review System	YES	NO

4.3 Research Method

Case study approaches to research are generally used when the subject is relatively new, and few studies already exist (Lauer and Asher, 1988). Because there is no documented, widely accepted methodology to measure environmental performance, or specifically, effects of environmental management systems, this research uses a case study approach. Probing interviews, which are used to gather as much information from the interviewee as possible (McDowell, 1991), were conducted by this researcher. Environmental managers at participating facilities were the subjects of the interviews.

Preliminary telephone interviews were conducted, for the researcher to determine the following:

- the interviewee was the correct person to speak to and would have knowledge regarding the topic;
- the interviewee would be available for the duration of the interview;
- the interviewee would be willing to provide the information (McDowell, 1991).

The interviewer asked each interviewee for relevant information to be mailed prior to the interview. Relevant information was described as marketing materials, annual reports, environmental reports, environmental management system documentation and any press releases pertaining to the environment. In cases where the information was considered proprietary, the researcher reviewed it on site prior to the commencement of the interview. Interviews were scheduled with each interviewee during the preliminary phone call. Each was expected to last between an hour and a half to two hours. Follow-up telephone interviews were conducted when necessary.

4.4 Interview Instrument

All interviews were conducted at the facility, in either the interviewee's office or a conference room nearby. Interviews were held at these locations to ensure convenience for the participants; these locations also helped participants feel comfortable. The interviewer took notes during the interviews, and recorded them when allowed to do so.

The interview instrument consisted of many open-ended questions. These were used to give the interviewee the freedom to respond with either a short or long answer (McDowell, 1991). Probes were also included in the instruments design to be used when more information was needed or seemed appropriate. The interview design was moderately structured, which allowed for adaptation to each interviewee while still covering specific topics (McDowell, 1991).

The interview questions were divided into three sections: questions pertaining to the characteristics of the company (as they relate to Table 2), questions that determine which elements of an ISO-EMS the facility already had in place, and questions that evaluate the benefits of the existing EMS (as they relate to Table 1, internal benefits). The questions relating to company characteristics were asked to determine if those which affect decisions to implement the ISO-EMS were present at this facility. This section also asked questions about the facilities experience with similar standards and familiarity with the ISO-EMS standard. The second section of questions were taken directly from the ISO-EMS requirements to determine how closely the present EMS resembles the ISO-EMS, an informal benchmarking exercise. The third section of questions assesses the results of implementing their present EMS, to determine if they could further benefit from

implementing as ISO-EMS. These questions relate to the following benefits of an EMS: an increased understanding of the effects their production processes can have on the natural environment; cost savings; a reduction in hazardous emissions; an increase in the number of pollution prevention activities implemented; reductions in the number of instances of regulatory noncompliance; and an improved relationship with both regulators and members of the surrounding community. The actual interview instrument is found in Appendix B.

4.5 Descriptions of Case Study Participants and Expected Outcomes

This section will give a brief description of the facilities which participated in this study. Following each company description, there are projections about the expected benefits if the firm were to implement an ISO-EMS (refer back to Table 1).

Facility A is characterized as a large, public, manufacturing company, which has had good experiences with past voluntary initiatives. It is part of a highly competitive market, where international trade plays an important role; it has facilities located in various countries. It also has outstanding environmental liabilities. All of these factors would suggest that this facility could benefit from implementing the ISO-EMS standard. However, other characteristics indicate the opposite. This facility is small, faces strict regulatory oversight, has a good compliance record and a progressive corporate culture that has recently changed the current EMS from reactive to proactive.

Based upon this characterization of Facility A it is expected that this facility will have an EMS in place which closely matches the ISO-EMS, and that the facility has already achieved all of the potential internal benefits that would be achieved by implementing an ISO-EMS. This characterization indicates that this facility would benefit from implementing the standard only if external factors become influential.

Facility B is characterized as a large, public, manufacturing company, which has had good experiences with past voluntary initiatives. It is part of a highly competitive market, in which international trade plays an important role. It has facilities located in various countries, and headquarters in Europe. It has taken measures to reduce its environmental liabilities and has no outstanding ones which affect operations at this facility. This facility's EMS is reactive, with a focus upon safety rather than environmental issues. All of these factors would suggest that this facility could benefit from implementing the ISO-EMS standard. However, other characteristics indicate the opposite. This facility is small, faces strict regulatory oversight, has a good compliance record and public image.

All factors considered, Facility B could strongly benefit from implementing the ISO-EMS. The current EMS is reactive in nature, which indicates that the facility could benefit from implementing the standard. Because this facility is part of a large company, it is also expected to have the resources needed to implement the standard. Finally, because it is a multinational company with headquarters in Europe, it is expected that the corporate culture would support ISO-EMS implementation.

Facility C is characterized as a public, manufacturing company, which has had positive experiences with past voluntary initiatives. These factors would suggest that this facility could benefit from implementing the ISO-EMS standard. However, other characteristics indicate the opposite. This facility is large but the company is considered small; it faces strict regulatory oversight, has a good compliance record and public image. The company competes in the international market place, but as part of a highly specialized niche. It has headquarters and facilities only in the United States. This company has a progressive corporate culture and a proactive EMS.

It is expected that this facility might not benefit from implementing the ISO-EMS. It does not have a great deal of resources to dedicate to implementation, and it already has a formal, proactive EMS in place. It already has a good public image, and no outstanding liabilities.

Facility D is characterized as a very large, multinational, public, manufacturing company, which has had positive experiences with past voluntary initiatives. This facility is also very large. This company's products are sold in a highly competitive market place, with much international trade. It has outstanding environmental liabilities, such as Superfund sites. These factors would suggest that this facility could benefit from implementing the ISO-EMS standard. However, other characteristics indicate the opposite. This facility faces strict regulatory oversight and has a good compliance record. This company has a progressive corporate culture and a proactive EMS.

Since Facility D already has a proactive, formal EMS in place, it is expected that ISO-EMS certification would not be useful at this facility, unless external factors become influential. It is expected that this facility will have an EMS in place which closely matches the ISO-EMS, and that the facility has already achieved all of the potential internal benefits that would be achieved by implementing an ISO-EMS.

Facility E is a small, privately owned company, and says it tries to maintain a proactive EMS, but has difficulty doing so because their limited staff can barely keep up with existing regulatory requirements. It has just one facility and does not compete in the international market place; its products are highly specialized. It has no experience with voluntary initiatives. It does face strict regulatory oversight, and has a compliance record that is average. Corporate culture at this facility is mixed: plant workers are not open to new ideas, including those about environmental responsibility, but the corporate staff tries to be progressive.

It is expected that this facility would not be affected by external forces encouraging implementation of an ISO-EMS. However, it could benefit from implementing the standard in the ways that are independent of those forces (refer to Table 1). However, the facility does not have the resources to implement the standard, so benefits of doing so might be outweighed by the strain on resources.

Of the facilities included in this study, it is expected that two could benefit from implementing the standard, independent of external forces which would encourage implementation of the standard. Based on the theories presented, three of the facilities

already have EMS which have resulted in the maximum benefits of improving process and management efficiency. The resulting case studies are found in the next five chapters.

4.6 Preview of Case Studies

The following is a description of elements included in each of the five case studies, found in Chapters Five through Nine. To determine the benefits of implementing an ISO-EMS, four factors should be examined. The first factor is the existence of criteria that warrant the use of an international standard for environmental management; the existing criteria found at study participant facilities were identified in the facility descriptions presented in the previous section. The second factor is the decision making process because how the information revealed by an EMS is used may affect the resulting benefits. This information is presented in this first section of each case study. An examination of each EMS and a comparison to the ISO-EMS requirements is presented in the second section of each case study. Finally, evaluation of the EMS is needed to determine whether further benefits could be attained from implementing an ISO-EMS. The third section of interview questions (see Appendix B) addresses these questions, and results are reported in the third section of each case study. Analysis of benefits already achieved and of further potential benefits is found in the last section of each case study.

CHAPTER 5

FACILITY A

Facility A is small, with only 62 employees, but is part of a large company. This plant has one main continuous production line, for a product used in the Wire & Cable, Rubber, Plastics and Coatings Industries. It produces two other materials, in smaller quantities. Customers are located throughout North and South America and the Far East. Utilities operated include the production of steam, water, air and a biological treatment plant for wastewater. The facility is located in a suburban community and has been there for over 60 years.

5.1 Corporate Hierarchy

The management structure at this facility has recently taken a team approach. Middle management positions have been eliminated, and each operations team has an hourly leader. The teams are responsible for all business aspects of its production line, including quality, environment, health and safety, and costs. There is an environmental coordinator who reports to the plant engineer. The environmental coordinator is the leader of the environmental committee, whose members come from the various teams. This committee is responsible for developing environmental management policies and procedures and evaluating environmental performance on a periodic basis.

5.2 Facility A Environmental Management System

5.2.1 Overview of EMS

Prior to 1991, Facility A's EMS consisted of a program of regulatory compliance, but nothing more aggressive. In 1991, the company implemented the Chemical Manufacturing Association's Responsible Care® program, see Appendix A. The six care codes are the basis for the EMS, which have accompanying operating policies to ensure that the codes are implemented throughout the facility.

The environmental committee rates the facility's performance in six of these areas twice a year -- one code is the subject of each monthly meeting. The most recent reviews show the environmental committee is satisfied that almost all code requirements are being met by the facility. Most code practices are in place and their implementation has been evaluated at least once by the committee.

5.2.2 Comparison of Facility A's EMS to the ISO-EMS

Facility A does have an environmental policy statement consistent with the requirements of an ISO-EMS. It was recently altered to reflect the New Jersey pollution prevention hierarchy. The plan is now reiterated at facility-wide, monthly meetings, because the environmental committee just decided that it was not being communicated to employees very well. The policy is communicated externally, to the community, through a quarterly newsletter and the activities of the community advisory panel[8].

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[8] Community advisory panels are groups which have representatives from the local community, industry, local officials, environmental groups, scientists and interested

The EMS at this facility is almost identical to the requirements of an ISO-EMS. In fact, the only element of an ISO-EMS not in place at this facility is clear environmental objectives consistent with continual improvement. The facility established, and met, environmental objectives, in compliance with the New Jersey Pollution Prevention Act, but has not redefined new ones. This facility has implemented 14 of 15 major elements required by an ISO-EMS, as Table 4 illustrates.

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individuals who meet to discuss issues regarding facility and community activities. These panels originated from the Responsible Care® program.

Table 4 Comparison of Facility A EMS to ISO-EMS

COMPARISON OF ISO-EMS REQUIREMENTS TO EMS AT FACILITY A	
Element	*Facility A*
Environmental Policy	YES
Identifying Environmental Aspects	YES
Tracking Legal Requirements	YES
Environmental Objectives	NO
Leadership and Commitment	YES
Pollution Prevention	YES
Training	YES
Internal and External Communication	YES
Documented Independent Procedures	YES
EMS Manual	YES
Emergency Plan	YES
Monitoring Procedures and Record Keeping	YES
Corrective and Preventive Action Procedures	YES
EMS Auditing	YES
Management Review System	YES

5.2.3 Results of Implementing EMS

The interview questions in Part III pertain to results of each company's current EMS, and how the EMS information is used throughout the business. The questions were divided into the following sections: environmental performance, accounting methods, products and community relations.

The questions regarding environmental performance did not ask about specific emission levels, or other topics which might be considered "sensitive." Instead, the questions focused on understanding of environmental processes and improvements made

to the facility, as a result of the current EMS. According to the environmental manager at Facility A, the aspects of its EMS implemented in order to comply with the New Jersey Pollution Prevention Act led to an increased understanding of its environmental impacts. Prior to implementing the Act's requirements, the facility tracked only emissions to the air. By tracking solid and liquid waste emissions, it gained an increased awareness about the amount of waste being generated. Also, the facility began to track its nonproduct output -- those outputs which are waste, or not part of the product -- which increased its awareness about the percentage of inputs which were wasted. Another lesson learned was about its raw emissions; previously, the facility had only measured emissions after pollution controls reduced the total. By re-evaluating these processes, the facility was able to reduce the amount of hazardous waste produced significantly.

This facility recently covered their open drainage ditches, which run throughout the facility. By covering these ditches, fugitive emissions have been reduced, odors prevented, and yields increased. This plant improvement came about as a result of the New Jersey Spill Act and the EMS. This facility has not had any incidents of noncompliance with state and federal statutes in six years, as a direct result of its EMS. Finally, this facility did not report cost savings from these improvements, however, by implementing pollution prevention activities, it was able to expand operations. Without these activities, operations would not have been expanded, because the facility's manufacturing activities would have result in emission levels beyond its permits.

The next two sets of questions, regarding accounting methods and products, focus on how information gathered from the EMS is used in decision-making by departments

outside of the environmental, health and safety division. Facility A did change some of its accounting methods to reflect information gathered by the EMS. Before its EMS, a single department code was used to attribute waste. Therefore, the departments had no incentive to reduce their waste levels. Now, each independent area has a code, and is charged for the amount of waste generated; this has reduced the waste generated by each team. The environmental manager stated that most cost savings which were a direct result of reduction in hazardous emissions are too trivial to calculate. The facility also examined costs of non-hazardous waste as a result of the EMS. It saved between $5,000 and 6,000 per year by reducing the number of dumpsters rented.

Purchasing patterns of hazardous materials changed because of the EMS. Toluene was completely eliminated from production processes. Cumene yield has increased due to pollution prevention, but it has not resulted in a change in purchasing patterns, because the facility uses a vast amount of it. The market drives prices, so there is no need to reflect price changes based on environmental costs incurred or saved. No products have been reformulated as a result of the information gathered by the EMS. Life cycle analysis is used when looking at new projects for the facility. The manager at this facility is not aware of research and development processes, so is unsure of environmental concerns being addressed during that phase of product development.

The final section of questions in Part III of the interview focused upon the relationship between the facility and its customers, contractors and neighbors. Facility A reported that its environmental record used to add a negative element to its reputation because there are Superfund sites on the property. However by working with regulators

and an environmental group to develop a plan to contain these problems, the company improved its relationship with state regulators. Also, the company's compliance record has improved greatly in recent years, so now its environmental record is a source of recognition among customers and suppliers. This facility has greatly improved its communications with the surrounding community as a direct result of its EMS. Initial meetings of the community advisory panel were adversarial, but now they are friendly. By informing the public about plant activities, and handling all complaints promptly and with respect, community members have changed their perception of the company. Facility A now feels welcomed by its neighbors.

5.3 Analysis

The EMS at this facility was not originally well received by the operations employees. They made no efforts to reduce waste or the number of spills. However, once the management style changed to grant operations workers more responsibility and leadership roles, the environmental program was given more attention. Workers began to take pride in their environmental practices and are often disappointed when accidental releases or spills occur.

Information collected during Part II of the interview reveals that Facility A has most of the elements of an ISO-EMS already in place. Facility A has achieved the internal benefits being considered in this study, by implementing its EMS which complies with state regulations and the chemical industry's Responsible Care® program. As indicated earlier, the facility has a thorough understanding of the potential environmental impacts of

production processes. This knowledge was gained by adding elements to the EMS, as required by the New Jersey pollution prevention program. As a result of the New Jersey program and other aspects included in its EMS, the facility has reduced its hazardous emissions and implemented many pollution prevention activities. Facility A's compliance record has drastically improved as a result of all of the EMS elements working together. The company's improved relationship with the community can be credited to the community advisory panel, which was established during implementation of the Responsible Care® codes. The lack of calculated environmental costs incurred or saved by the EMS presents an area of weakness in the overall program.

This company has begun to integrate aspects of its environmental management program into its corporate business strategy, which according to experts is the ultimate goal of an EMS (Cohan and Gess, 1994/1995 and Epstein, 1996). This is illustrated by the changes in its accounting methods-- the company is using environmental data in areas outside of the environmental, safety and health department. It is also illustrated by using life cycle analysis in developing new projects.

This facility has achieved all of the potential internal benefits of implementing an ISO-EMS: improved understanding of potential environmental impacts, reduction in hazardous emissions, improved compliance record, implementation of pollution prevention activities and improved relationship with regulators and surrounding community. The area of weakness, tracking costs of the EMS, would not be improved by implementing an ISO-EMS. Therefore, implementing an ISO-EMS as part of the corporate environmental strategy would not be an effective use of the company's resources, because doing so

would not affect the environmental performance. Thus, ISO 14000 should only be considered as a strategy for international competitiveness.

CHAPTER 6

FACILITY B

Company B is a small facility with only 36 employees, but is part of a very large, international pharmaceutical company. The plant included in this study has three main production lines. The principal markets for one product line are for use in gasoline products, pesticides and plastics. Another product line is used in perfume products. The third product line is sold mainly for use in the textile industry. This facility is located in an urban area, and has been there for many years.

6.1 Corporate Hierarchy

Facility B has a corporate executive committee which consists of the highest level officials, each of whom oversees specific sectors, countries and functions of the organization. The Health-Safety and Environment Officer reports to the Vice-Chairman on the Executive Committee. At the facility level, the plant manager is the highest official, and the environmental engineer reports directly to him[9].

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[9] This organization information comes from "Company B In Brief 1995."

6.2 Facility B Environmental Management System

6.2.1 Overview of EMS

This facility does not have a formal EMS. It does adhere to the Responsible Care® codes, but much of the program focuses on Health and Safety, which overlaps with some environmental aspects. The entire facility is audited at least every two years by members of the corporate staff, and this audit includes environmental aspects.

6.2.2 Comparison of Facility B's EMS to the ISO-EMS

Facility B does have an environmental policy statement consistent with the requirements of an ISO-EMS, see Figure 4. It was first drafted by management and outside consultants, with input from operations employees. It is reviewed and revised approximately every three years by the executive committee. When the policy was first implemented, there were meetings held to educate employees and brochures were distributed. The environmental policy is communicated to the public via the annual Environmental Report.

Environmental Protection

•Design-in environmetal considerations at every stage of product developoment and marketing

•Permanently look to reduce the environmental impact of our business by stressing pollution prevention, preferring clean technologies and minimising accidental pollution.

•Ensure strict control over effluents, atmospheric release and waste.

Figure 4 Portion of Facility B's Health, Safety and Environmental Policy

The EMS at this facility is a combination of regulatory compliance programs and Responsible Care®. It has nine out of 15 ISO-EMS elements in place, as Table 5 illustrates. At this facility, there is more concern about health and safety issues than environmental ones. This may be because the company believes its environmental record is satisfactory, and wants to improve its health and safety record.

6.2.3 Results of Implementing EMS

The interview questions in Part III pertain to results of each company's current EMS, and how the EMS information is used throughout the business. The questions were divided into the following sections: environmental performance, accounting methods, products and community relations.

Table 5 Comparison of Facility B EMS to ISO-EMS

COMPARISON OF ISO-EMS REQUIREMENTS TO EMS AT FACILITY B	
Element	*Facility B*
Environmental Policy	YES
Identifying Environmental Aspects	YES
Tracking Legal Requirements	YES
Environmental Objectives	NO
Leadership and Commitment	NO
Pollution Prevention	NO
Training	YES
Internal and External Communication	NO
Documented Independent Procedures	YES
EMS Manual	NO
Emergency Plan	YES
Monitoring Procedures and Record Keeping	YES
Corrective and Preventive Action Procedures	YES
EMS Auditing	YES
Management Review System	NO

The questions regarding environmental performance did not ask about specific emission levels, or other topics which might be considered "sensitive." Instead, the questions focused on understanding of environmental processes and improvements made to the facility, as a result of the current EMS. The process at this facility is quite old and has been studied by Company B many times, leaving the environmental manager confident that all environmental impacts resulting from the production processes are well understood, and that all pollution prevention activities which would be feasible are already in place. However, when new technology was added to comply with local waste

water requirements, the facility management sought (and implemented) a pollution prevention activity, in-process recycling of waste water. As a result of implementing the current EMS, the facility has significantly reduced the number of incidents which result in noncompliance. The environmental manager estimated that ten years ago there would be four or five episodes a year, but in the past few years there have been one or none. This facility is implementing a preventive maintenance program, which will help management detect fugitive emissions and prevent leaks, spills and emissions. The estimate of dollars saved from the in-process recycling is about $200,000 - $300,000 per annum.

The next two sets of questions, regarding accounting methods and products, focus on how information gathered from the EMS is used in decision-making by departments outside of the environmental, health and safety division. Facility B has not changed its accounting methods to reflect information gathered by the EMS. Purchasing patterns of hazardous materials have not changed because of the EMS. According to the manager the age of this facility and its equipment make using alternative inputs impossible. Market drives prices, so price changes do not reflect environmental costs incurred or saved. New products go through life cycle analysis scrutiny by research and development teams, but existing products and processes do not.

The final section of questions in Part III of the interview focused upon the relationship between the facility and its customers, contractors and neighbors. This facility stopped using a process which created an odor; this action greatly improved the

relationship between Facility B and neighbors. Corporate headquarters publishes an annual environmental report.

6.3 Analysis

Facility B first developed an environmental policy for its American division after acquiring many smaller companies and discovering that those companies had much lower environmental, health and safety standards than the parent company. This facility does participate in the Responsible Care® program, and has an EMS, but it is not well communicated to all employees at the facility. The plant focuses on safety issues and tries to incorporate environmental issues into safety concerns whenever possible.

Information collected during Part II of the interview reveals that Facility B has more than half of the elements of an ISO-EMS already in place. Facility B has achieved the internal benefits being considered in this study, by including in its EMS compliance with state regulations and the chemical industry's Responsible Care® program requirements. As indicated earlier, the facility has a thorough understanding of the potential environmental impacts of its production processes. As a result of the New Jersey program and other aspects of its EMS, it has reduced its hazardous emissions. Facility B's compliance record has drastically improved as a result of all of the EMS elements working together. The improved relationship with its community can be credited to the odor reduction.

This facility has achieved the following potential internal benefits of implementing an ISO-EMS: improved understanding of potential environmental impacts, reduction in hazardous emissions, pollution prevention activities, improved compliance record, and improved relationship with regulators and surrounding community. The area of weakness, tracking costs of the EMS, would not be improved by implementing an ISO-EMS. Implementing an ISO-EMS as part of the corporate environmental strategy would not be an effective use of the company's resources because doing so would not affect the environmental performance. Thus, ISO 14000 should only be considered as a strategy for international competitiveness, not as part of the corporate environmental strategy.

CHAPTER 7

FACILITY C

Company C is considered a small company in relation to its competitors within the chemical industry, but is publicly traded as a medium sized company. The facility included in this study is also the corporate headquarters. There are about 100 corporate employees and 150 production workers at this facility. The company has two main business units: environmental products and services and textile chemical specialties. Its environmental products include ion exchange resins, reverse osmosis membranes, biochemicals and polymers. The textile group manufactures textile chemicals for wet processing and highly refined, custom-manufactured chemicals. End-user industries for Company C products are electronics, utilities, oil refining, textile dyeing and finishing, municipalities, pharmaceuticals, steel, chemicals and automobile manufacturing. This facility is set in a rural community.

7.1 Corporate Hierarchy

The Director of Regulatory Compliance is responsible for the EMS at Facility C. He is supervised by the Executive Vice-President of the environmental products and services business unit, who in turn, reports to the CEO. There are two environmental engineers who work for the Director of Regulatory Compliance, both of whom are responsible for monitoring and maintaining the EMS implementation.

7.2 Facility C Environmental Management System

7.2.1 Overview of EMS

This company has a detailed environmental management program. There is an environmental policy, which was written by directors of top management. This policy is a commitment to regulatory compliance and to waste minimization efforts which go beyond compliance requirements. The Director of Regulatory Compliance, with aid from directors of relevant programs, has also documented detailed procedures and policies for all areas of operations, which may have environmental impacts.

7.2.2 Comparison of Facility C's EMS to the ISO-EMS

Facility C does have an environmental policy consistent with the requirements of an ISO-EMS, see Figure 5. All employees are made aware of the policy during their initial job training. The policy is posted in the facility's main entrance for employees and visitors to read. The policy is also reiterated at monthly meetings with all production managers, and any revisions based on new regulations or suggestions from production workers are also made at this time. The policy is communicated to the community through a variety of programs, including newletters, meetings, a Neighborhood Involvement Council and a telephone broadcast system for facility neighbors to receive messages from the plant managers.

The EMS at this facility meets all of the requirements of an ISO-EMS. This facility has implemented 15 of 15 major elements required by an ISO-EMS, as Table 6 illustrates.

ENVIRONMENTAL POLICY - FACILITY C

As a cornerstone of our basis Independent Principle of Compliance and Citizenship, it is the express intention and policy of Facility C not only to remain in full compliance with all environmental codes, regulations and laws enacted by applicable local, state, federal or national agencies, but also to strive for enhancing the qualities of our environment. This means going beyond compliance, for instance to minimize the quantities of wastes generated at our facilities, and to reduce ultimate emissions of these materials to the environment.

We insist that our employees who may have impact on our environmental performance adhere to this policy, understand and maintain compliance with all applicable codes, regulations and laws, and consider environmental concerns importantly as profit or cost concerns. We further encourage all employees to bring to management's attention any issues that they feel can enhance our environmental performance.

Figure 5 Facility C's Environmental Policy, as distributed for permanent posting

Table 6 Comparison of Facility C EMS to ISO-EMS

COMPARISON OF ISO-EMS REQUIREMENTS TO EMS AT FACILITY C	
Element	*Facility C*
Environmental Policy	YES
Identifying Environmental Aspects	YES
Tracking Legal Requirements	YES
Environmental Objectives	YES
Leadership and Commitment	YES
Pollution Prevention	YES
Training	YES
Internal and External Communication	YES
Documented Independent Procedures	YES
EMS Manual	YES
Emergency Plan	YES
Monitoring Procedures and Record Keeping	YES
Corrective and Preventive Action Procedures	YES
EMS Auditing	YES
Management Review System	YES

7.2.3 Results of Implementing EMS

The interview questions in Part III pertain to results of each company's current EMS, and how the EMS information is used throughout the business. The questions were divided into the following sections: environmental performance, accounting methods, products and community relations.

The questions regarding environmental performance did not ask about specific emission levels, or other topics which might be considered "sensitive." Instead, the questions focused on understanding of environmental processes and improvements made to the facility, as a result of the current EMS. This facility began to devise pollution prevention plans as a requirement for a New Jersey pilot program, using a facility-wide permit to replace individual, single-media permits. Measuring nonproduct output and calculating mass balances, as required by the New Jersey pollution prevention program, combined with the pilot program's planning process resulted in an increased understanding of the environmental impacts of their production processes. Participating in the pilot program excludes this facility from the traditional compliance regulations. The facility has reported reduction in air emissions and nonproduct output as a result of the New Jersey Pollution Prevention Act requirements. Other pollution prevention activities include substitution of hazardous materials, such as zinc compounds, with less hazardous materials in five different products. Another material substitution was made when they replaced chromium with another less hazardous material in a product. This facility eliminated all use of toluene, a highly toxic substance. It was used to clean storage tanks, but now an aqueous process is used. The facility also reuses sulfuric and caustic acid in scrubbers,

greatly reducing the volume used. Finally, the facility does do on-site and off-site recycling for many materials. This facility reports it has saved money on some of their pollution prevention activities, but not all of them. Many of its environmental activities are driven by the goal of improving public image, rather than the goal of direct cost savings.

The next two sets of questions, regarding accounting methods and products, focus on how information gathered from the EMS is used in decision-making by departments outside of the environmental, health and safety division. Facility C did change some of its accounting methods to reflect information gathered by the EMS. It now uses standard costing for each batch and each process, to account for all materials going through the process and discover percentages being lost as emissions. Purchasing patterns of hazardous materials changed because of the EMS. Toluene was completely eliminated from production processes. In recent years, the company has been able to greatly reduce purchases of the following hazardous materials: a zinc compound, chromium, sulfuric and caustic acid. The prices of products fluctuate regularly, and the company uses many different methods to keep costs down, such as switching to reusable packaging and less energy intensive forms of transportation.

The final section of questions in Part III of the interview focused upon the relationship between the facility and its customers, contractors and neighbors. After being involved in Superfund sites through relationships with reckless contractors, the management at this facility looks for respected contractors and environmentally responsible business partners. As a result of its EMS and Responsible Care® programs, it

has opened communications with neighbors. The environmental manager reports that the company has an easier time obtaining new permits because public hearings are less confrontational, now that open communications with the public has been established. Also, there is less fear of the facility by community members, because they have been educated about the products, processes and potential risks.

7.3 Analysis

Facility C began developing its EMS in 1990; it was implemented in 1992. An EMS was initiated after an accidental leak omitted noxious odors and resulted in complaints from neighbors and penalties from regulators. Additional support for an EMS came from company executives with leadership positions within industry organizations. They wanted to ensure that their company is taking a proactive approach to environmental management and can be viewed as an industry leader. The executives believe that their company should be setting the standard for which other companies will follow. Corporate staff supported the environmental program from the outset, and as production workers were educated about the program's importance, they too supported it.

Information collected during Part II of the interview reveals that Facility C has all of the elements of an ISO-EMS already in place. Facility C has achieved the internal benefits being considered in this study, by implementing its EMS and participating in the facility-wide pilot program. As indicated earlier, the facility has a thorough understanding of the potential environmental impacts of its production processes. This knowledge was

gained by adding elements to its EMS, required by the New Jersey pollution prevention program. As a result of the New Jersey program and other aspects of their EMS, the facility has reduced its hazardous emissions and implemented many pollution prevention activities. Its improved relationship with the community can be credited to its EMS.

This company has begun to integrate aspects of its environmental management program into its corporate business strategy, which according to experts is the ultimate goal of an EMS (Cohan and Gess, 1994/1995 and Epstein, 1996). This is illustrated by the changes in accounting methods -- environmental data is being used in areas outside of the environmental, safety and health department.

This facility has achieved all of the potential internal benefits of implementing an ISO- EMS: improved understanding of potential environmental impacts, cost savings, reduction in hazardous emissions, improved compliance record, implementation of pollution prevention activities and improved relationship with regulators and surrounding community. Therefore, implementing an ISO-EMS as part of the corporate environmental strategy would not be an effective use of the company's resources because doing so would not affect the environmental performance. Thus, ISO 14000 should only be considered as a strategy for international competitiveness, not as part of the corporate environmental strategy.

CHAPTER 8

FACILITY D

Facility D is one of the largest companies in the chemical industry, with many facilities around the world. The facility included in this report is one of the oldest and largest facilities within this company. The site houses many business units and manufactures hundreds of product lines. Products produced here are mainly materials or chemical additives that go into other consumer products. This facility is set in a suburban community.

8.1 Corporate Hierarchy

The Vice-President of Safety, Health and the Environment is responsible for all environmental programs, and reports to the Chief Executive Officer for this facility. Because of the sheer size of this facility, the environmental responsibilities are divided differently than in the other case studies presented. There is an environmental affairs team which is responsible for most aspects of the EMS, throughout all of the business units. However, there are also other teams which share some of the responsibilities. For example, there is a team of employees from various areas which works on implementing and monitoring the Responsible Care® program. Another team was responsible for New Jersey pollution prevention plans, which was also made up of employees from various departments, not just the safety, health and environment division.

8.2 Facility D Environmental Management System

8.2.1 Overview of EMS

Facility D facility has many different environmental programs in place, but not one overall EMS. There are regulatory compliance programs overseen by the safety, health and environment division. There are environmental policies with aggressive goals of zero emissions to the environment and zero wastes; this goal ensures continual improvement. There is also a team of employees representing all areas to work on the environmental policies. This committee compares environmental data to the corporate goals, and makes capital funding decisions. The facility management worked on a joint waste minimization project with the United States Environmental Protection Agency; the project took two years to complete. The report "Facility D Waste Minimization Project" written in 1993, documents the goals, methodology, results and a critique of the waste minimization program at this facility. The report also describes 15 case studies: experiences in waste reduction for organic chemical processes. Approximately 150 employees, from various divisions contributed to this effort. Each business unit also generates an environmental policy, consistent with the corporate waste minimization goals and priorities.

8.2.2 Comparison of Facility D's EMS to the ISO-EMS

This facility's site principle relevant to the environment simply states "We will meet our business needs without injuring people or the environment." The facility also supports and implements the Facility D Commitment to Safety, Health and the Environment

(see Figure 6). There is a corporate-wide Environmental Excellence Award Program, whose results are documented in an annual report, devoted to just this topic. There are also monetary Accomplishment Awards for innovative ideas. This helps communicate the importance of the environmental commitment to employees. Safety, health and environmental reports are generated weekly, which give negative attention to departments with spills or accidental releases. These reports increases awareness and drives employees to continue developing ideas for waste reduction. There are meetings every morning which reiterate environmental and safety issues.

The facility publishes an annual environmental report to communicate environmental goals and projects to employees and the public. There is also a community advisory panel, which is made up of community members and representatives from this facility. There is also a hotline for neighbors of the facility to call with questions or comments about the site's activities.

The EMS at this facility meets all of the categories of ISO-EMS requirements, except for one. The facility is missing an environmental management manual, which states operating policies, procedures and responsibilities for them. At the time of the interview, such a manual was in the process of being developed, but was far from completion. This facility has implemented 14 of 15 major elements required by an ISO-EMS, as Table 7 illustrates.

The Facility D Commitment
Safety, Health and the Environment

We affirm to all our stakeholders, including our employees, customers, shareholders and the public, that we will conduct our business with respect and care for the environment. We will implement those strategies that build successful businesses and achieve the greatest benefit for all of our stakeholders without comprising the ability of future generations to meet their needs.

We will continuously improve our practices in light of advances in technology and new understanding in safety, health and environmental science. We will make consistent, measurable progress in implementing this Commitment throughout our worldwide operations. Facility D supports the chemical industry's Responsible Care®, the oil industry's Strategies for Today's Environmental Partnership as key programs to achieve this Commitment.

Figure 6 Facility D's Commitment to Health, Safety and the Environment

Table 7 Comparison of Facility D EMS to ISO-EMS

COMPARISON OF ISO-EMS REQUIREMENTS TO EMS AT FACILITY D	
Element	*Facility D*
Environmental Policy	YES
Identifying Environmental Aspects	YES
Tracking Legal Requirements	YES
Environmental Objectives	YES
Leadership and Commitment	YES
Pollution Prevention	YES
Training	YES
Internal and External Communication	YES
Documented Independent Procedures	YES
EMS Manual	NO
Emergency Plan	YES
Monitoring Procedures and Record Keeping	YES
Corrective and Preventive Action Procedures	YES
EMS Auditing	YES
Management Review System	YES

8.2.3 Results of Implementing EMS

The interview questions in Part III pertain to results of each company's current EMS, and how the EMS information is used throughout the business. The questions were divided into the following sections: environmental performance, accounting methods, products and community relations.

The questions regarding environmental performance did not ask about specific emission levels, or other topics which might be considered "sensitive." Instead, the questions focused on understanding of environmental processes and improvements made to the facility, as a result of the current EMS. This facility agreed to participate in a joint program with the United States Environmental Protection Agency (USEPA), with the goal of identifying and documenting pollution prevention initiatives. This program, combined the New Jersey Pollution Prevention Act requirement to calculate nonproduct output, has given management at this facility a thorough understanding of the environmental impacts of their production processes. According to the information reported to the USEPA, in compliance with the Toxic Release Inventory requirements, the facility has reduced emissions to land, air and water significantly in recent years. In 1987, it reported 6.61 million pounds of total emissions to all media. In 1994, it reported only 1.90 million pounds of total emissions. Six years ago, it had 20 instances of noncompliance. In 1994, it had only one. Pollution prevention activities which led to these reductions include collecting and reusing solvents, solvent wash replacing a high-pressure stream of water, replacing single-use drums with reusable packaging, and waste

reduction by changing from a batch process to a continuous process. Most of the large investments have paid back within three years.

The next two sets of questions, regarding accounting methods and products, focus on how information gathered from the EMS is used in decision-making by departments outside of the environmental, health and safety division. Facility D did change some of its accounting methods to reflect information gathered by the EMS. Each production line is charged the fair market price for the amount of waste water sent to the treatment plant, instead of considering the cost of operating it as an overhead, static cost. This has increased pollution prevention awareness among the production workers. Another example of how this company is using environmental costs in other business areas is that human resources are distributed in a similar fashion to waste water. Members of the environmental affairs team forecast the percentage of time spent working on specific issues at a production line, and the lines are charged accordingly. Purchasing patterns of hazardous materials changed because of the EMS; certain product lines have been discontinued or hazardous substances have been replaced with less hazardous ones. Product prices are market driven, so there is no need to reflect price changes based on environmental costs incurred or saved. Life cycle analysis is used for research and development of new products, but existing ones are not scrutinized in this way.

The final section of questions in Part III of the interview focused upon the relationship between the facility and its customers, contractors and neighbors. This facility, upon taking on the partnership with the USEPA, has a good relationship with regulators. A good relationship with neighbors is reported, because of the jobs provided

by the facility, although the public has voiced concerns regarding carcinogens. Since implementing the EMS, the company reports more open communication with the neighbors via the community advisory panel. To meet the requirements of the New Jersey pollution prevention program an annual environmental report for this just facility has been published, along with the one for the corporation as a whole. Employees are working with community members to make future issues of this report easier to understand.

8.3 Analysis

This facility is so large that there is no one comprehensive EMS. Different business units are treated separately, and each have their own five year environmental plan. Environmental plans are developed to help units achieve the corporate goals of zero emissions and zero wastes. Since these goals have been established for the company, most employees have been enthusiastic about implementing the programs designed to meet these aggressive goals. Some operations employees have also taken the initiative and come up with their own suggestions for improving environmental performance at the facility. Personnel who do have innovative ideas can be acknowledged for their contributions by either Environmental Excellence awards or monetary awards. This facility was instrumental in drafting the Responsible Care® codes, and believes that in some areas, the program in not as strict as its own programs.

Information collected during Part II of the interview reveals that Facility D has most of the elements of an ISO-EMS already in place. Facility D has achieved the internal benefits being considered in this study, by implementing its EMS and complying with state

regulations and participating in USEPA programs. As indicated earlier, the facility has a thorough understanding of the potential environmental impacts of production processes. This knowledge was gained by adding elements to the EMS, as required by the New Jersey pollution prevention program and its partnership with the USEPA. As a result of these programs and other aspects of the EMS, the facility has reduced its hazardous emissions and implemented many pollution prevention activities. Facility D's compliance record has drastically improved as a result of all of the EMS elements working together. Improved communications with the community can be credited to its community advisory panel and the facility environmental report.

This facility has achieved all of the potential internal benefits of implementing an ISO-EMS: improved understanding of potential environmental impacts, cost savings, reduction in hazardous emissions, improved compliance record, implementation of pollution prevention activities and improved relationship with regulators and surrounding community. Implementing an ISO-EMS as part of the corporate environmental strategy would not be an effective use of the company's resources because doing so would not affect the environmental performance. Thus, ISO 14000 should only be considered as a strategy for international competitiveness, not as part of the corporate environmental strategy.

CHAPTER 9

FACILITY E

Company E is a small, family owned company in New Jersey. Its main product lines are adhesives for the textile industry. Company officials will not disclose its primary markets. There are 38 employees, at this the company's only facility, which is located in a suburban community.

9.1 Corporate Hierarchy

The environmental, health and safety manager is responsible for all environmental programs at this facility. This manager reports directly to the president/owner of the company. He/she works closely with the Technical Director to ensure that processes are in compliance with environmental regulations.

9.2 Facility E Environmental Management System

9.2.1 Overview of EMS

This facility does not have one, all encompassing EMS for the whole facility, instead it has compliance programs established for each regulation by which it is governed.

9.2.2 Comparison of Facility E's EMS to the ISO-EMS

Facility E does not have a formal, an environmental policy. It did draft one during the New Jersey Pollution Prevention planning process; however, it was never distributed

9.2.2 Comparison of Facility E's EMS to the ISO-EMS

Facility E does not have a formal, an environmental policy. It did draft one during the New Jersey Pollution Prevention planning process; however, it was never distributed throughout the facility. Nor has it been communicated to members of the community.

By developing compliance programs for each environmental and Occupational Health and Safety regulation, Facility E does have environmental programs in place. However, the combination of these programs does not fit the widely accepted definition of an EMS because there are no established goals, only responses to regulations. This facility has implemented seven of 15 major elements required by an ISO-EMS, as Table 8 illustrates.

Table 8 Comparison of Facility E EMS to ISO-EMS

COMPARISON OF ISO-EMS REQUIREMENTS TO EMS AT FACILITY E	
Element	*Facility E*
Environmental Policy	NO
Identifying Environmental Aspects	NO
Tracking Legal Requirements	YES
Environmental Objectives	NO
Leadership and Commitment	NO
Pollution Prevention	YES
Training	YES
Internal and External Communication	NO
Documented Independent Procedures	YES
EMS Manual	NO
Emergency Plan	YES
Monitoring Procedures and Record Keeping	YES
Corrective and Preventive Action Procedures	YES
EMS Auditing	NO
Management Review System	NO

9.2.3 Results of Implementing EMS

The interview questions in Part III pertain to results of each company's current EMS, and how the EMS information is used throughout the business. The questions were divided into the following sections: environmental performance, accounting methods, products and community relations.

The questions regarding environmental performance did not ask about specific emission levels, or other topics which might be considered "sensitive." Instead, the questions focused on understanding of environmental processes and improvements made to the facility, as a result of the current EMS. The environmental manager at Facility E says that the company has always used some pollution prevention techniques, such as in-process recycling whenever feasible. In order to comply with the New Jersey pollution prevention program, the company worked with consultants from the New Jersey Technical Assistance Program at the New Jersey Institute of Technology. However, neither the consultants nor the company management were able to discover pollution prevention options which would be acceptable to the company's customers[10]. This facility reports having no fugitive emissions and a relatively good compliance record. It has had minor instances of non-compliance, such as submitting monthly lab reports to the NJDEP a few days late. The company does not calculate costs of its environmental programs.

The next two sets of questions, regarding accounting methods and products, focus on how information gathered from its environmental programs is used in decision-making

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[10] Some of their customers are large institutions with specifications which they must meet in order to retain them as a client.

by departments outside of the environmental, health and safety division. Facility E says that while most of the environmental data it collects is to satisfy reporting requirements, it has used this information to make decisions about product lines. For example, information collected for reporting purposes revealed that significant amounts of solvent were being released to the environment, resulting in the decision to eliminate the product line. Purchasing patterns of hazardous materials have changed to reflect environmental regulation: lead and 1-1-1 Trichloroethane have been eliminated from all production processes. Prices are controlled by the market, so the company has not adjusted prices to reflect environmental costs incurred or saved. Environmental concerns are addressed during research and development stage for new products, using a life cycle analysis approach.

The final section of questions in Part III of the interview focused upon the relationship between the facility and its customers, contractors and neighbors. Facility E does try to work with its customers to make products safer for the environment, but it is not always possible. Often new, safer products do not satisfy the customers' needs. The environmental manager reports that even when the efforts are not successful, the customers usually appreciate the effort, and are generally happy to hear about successful product changes. This facility reports that it has never had any problems with environmental regulators or the community, so there is no need to improve these relationships. Management representatives from this facility also work closely with local regulators and the Tri-County Chamber of Commerce, Government Affairs Office to work on new environmental programs.

9.3 Analysis

Facility E does not have one overriding EMS, but instead, has compliance programs for various environmental regulations. The corporate staff acknowledges the importance of quality environmental performance, but operations personnel do not. These employees ensure that the facility's procedures do comply with regulations, but do not take any initiative to improve the plant's environmental performance. Facility E states that it does take a proactive approach to environmental compliance. It tries to begin implementation of new programs as they are developed, before they become mandatory, whenever possible.

Part II of the interview reveals that Facility E has half of the ISO-EMS requirements in place. Despite its lack of a comprehensive EMS, Facility E has achieved the relevant internal benefits being considered in this study. Not all of the benefits being considered are relevant to the needs of this small company. It has undergone extensive pollution prevention planning with consultants to improve its understanding of its production processes. Because of the nature of the products and current independent procedures which include pollution prevention activities, the facility believes it has lowered its hazardous emissions as much as is feasible. It reports being satisfied with its current compliance record, with violations being based on clerical errors rather than truly dangerous problems; and the company does not have the resources to dedicate more attention to these clerical areas. Because it has never had problems with regulators or members of the community, an ISO-EMS benefit of improved relationships is not relevant

to the needs of this facility. The lack of calculated environmental costs incurred or saved by its environmental programs presents an area of weakness in the overall program.

This company has begun to integrate aspects of its environmental compliance programs into its corporate business strategy, which according to experts is the ultimate goal of an EMS (Cohan and Gess, 1994/1995 and Epstein, 1996). Because it is such a small company, it is easy to share data among divisions, and this is done regularly at Opportunity for Improvements meetings. The size of this facility prevents the existence of an entire environmental, health and safety division; instead there is an individual who works on these issues, who is supported by other individuals from other departments, as needed. Integration of environmental considerations into other business areas is also illustrated by using life cycle analysis in developing new projects.

Facility E is a very small company with limited resources, so implementing the ISO-EMS would be a significant burden. This facility has achieved all of the potential internal benefits of implementing an ISO-EMS, which are relevant to its needs: improved understanding of potential environmental impacts, reduction in hazardous emissions, improved compliance record, and implementation of pollution prevention activities. Therefore, implementing an ISO-EMS as part of the corporate environmental strategy would not be an effective use of the company's resources because doing so would not affect the environmental performance. Thus, ISO 14000 should only be considered as a strategy for international competitiveness, not as part of the corporate environmental strategy.

CHAPTER 10

CONCLUSION

This chapter will summarize the concepts included in this thesis, the purpose of this study and the results. Policy implications and areas for future study are discussed.

10.1 Summary

Environmental policies are being developed by many companies to address public concerns about the environment. These companies are using environmental management systems to achieve the goals set forth in the plans. EMS can provide managers with information that helps them understand the environmental aspects of production, comply with regulations and improve overall performance.

Since a proliferation of EMS standards have been developed for regions, industries and nations, the ISO designed ISO 14000 Series of Environmental Management Standards. However, before managers adopt the ISO-EMS requirements, they need more information about the potential benefits of doing so. This purpose of this thesis was to determine if United States facilities would benefit from adopting the ISO-EMS standard.

This collection of case studies examined chemical companies in New Jersey, and found that participating companies believed their current EMS had already achieved the potential internal benefits of an ISO-EMS. Although there have been indications that state and federal agencies are considering using the standard to improve the flexibility of

regulatory programs (Barnes, 1996), this study found that such programs may not improve the quality of a firm's environmental management program.

10.2 Evaluation of Current EMS

Before the potential internal benefits of implementing an ISO-EMS could be determined, each facility's current EMS had to be evaluated. This was accomplished by comparing the current EMS to the ISO requirements, see Table 9. Because of the comprehensive regulatory program in the United States and in New Jersey specifically, all of the companies fulfill some of the requirements of the ISO-EMS standard. Companies following a program of legal compliance would have almost half of the standard implemented; Company E provides evidence of this by having seven out of 15 elements in place. Elements not required by other regulatory programs include: clearly stated commitment to the EMS, an EMS manual and an audit of the EMS.

Table 9 Comparison of ISO-EMS requirements to EMS at case study companies

COMPARISON OF ISO-EMS REQUIREMENTS TO EMS AT CASE STUDY COMPANIES					
Element	*Company A*	*Company B*	*Company C*	*Company D*	*Company E*
Environmental Policy	YES	YES	YES	YES	NO
Identifying Environmental Aspects	YES	YES	YES	YES	NO
Tracking Legal Requirements	YES	YES	YES	YES	YES
Environmental Objectives	NO	NO	YES	YES	NO
Leadership and Commitment	YES	NO	YES	YES	NO
Pollution Prevention	YES	NO	YES	YES	YES
Training	YES	YES	YES	YES	YES
Internal and External Communication	YES	NO	YES	YES	NO
Documented Independent Procedures	YES	YES	YES	YES	YES
EMS Manual	YES	NO	YES	NO	NO
Emergency Plan	YES	YES	YES	YES	YES
Monitoring Procedures and Record Keeping	YES	YES	YES	YES	YES
Corrective and Preventive Action Procedures	YES	YES	YES	YES	YES
EMS Auditing	YES	YES	YES	YES	NO
Management Review System	YES	NO	YES	YES	NO

10.3 Assessment of Potential Benefits

Potential internal benefits a firm could experience through implementing an ISO-EMS include: better understanding of environmental impacts of production processes; reduced hazardous emissions; implementation of pollution prevention activities; fewer instances of noncompliance with state and federal laws; better relationship with surrounding community and regulators and cost savings.

Of the five facilities presented in this study, based on the projections set forth in Chapter 2, one could reasonably expect that one company would benefit from implementing an ISO-EMS and three companies would not. Furthermore, it was expected that one company might benefit if the gain outweighed the strain on resources incurred by implementation.

Facility A would not be expected to benefit from ISO-EMS implementation because it is a small facility with a proactive EMS and a corporate culture which supports environmental improvement. As Table 10 indicates, Facility A has achieved all of the benefits of an ISO-EMS with its current EMS in place.

Facility B would be expected to benefit from implementing an ISO-EMS because it is part of a multinational firm that has facilities in many countries. Also, international trade is very important to this company. Facility B, which is small, has an EMS that is reactive, rather than proactive. This facility has already achieved four of the six benefits of implementing an ISO-EMS, with its current EMS in place (see Table 10).

Facility C, a small company with much international trade, was not expected to benefit from implementing the standard for two reasons. The first reason is that the company is small and implementation would represent a drain on its resources. The second reason is that the company has a proactive, formal EMS in place already. As Table 10 indicates, Facility C achieved all of the benefits of an ISO-EMS except cost savings.

Facility D was not expected to benefit from implementing an ISO-EMS because it too has a formal, proactive EMS in place already; Table 10 indicates that this facility achieved the benefits of an ISO-EMS with its current EMS.

Facility E, a small company with limited resources, was expected to benefit from implementing an ISO-EMS if the strain on resources would not be prohibitive. Facility E has achieved half of the benefits of an ISO-EMS, as Table 10 indicates.

The expectations set forth about which firms could benefit from implementing the standard proved true.

It should be noted that the one benefit which three of the five facilities did not report achieving by their current EMS is cost savings. However, the managers interviewed also said that costs were not carefully tracked, thus savings could not be carefully tracked. The benefit of cost savings may have been achieved at these firms, but the flaw is in the accounting methods employed, not because of missing elements of an ISO-EMS. However, since ISO-EMS requirements do not address accounting methods, it would not be expected that firms would realize cost savings if they were to implement the standard.

This analysis shows that most of the companies have already achieved all of the internal benefits of ISO-EMS certification with the EMS in place. The facilities that have not achieved all of the potential benefits of ISO-EMS are the small facilities, which do not have proactive EMS. ISO certification could be a burden because these small facilities lack both the financial and human resources to dedicate to such a program. The only other benefits which might come from implementing an ISO-EMS are international competitive advantages and fulfilling customer needs, neither of which are a part of strategic environmental planning.

Table 10 Illustration of benefits achieved current EMS

POTENTIAL INDEPENDENT BENEFITS FROM COMPLYING WITH ISO-EMS					
Benefit	*Company A*	*Company B*	*Company C*	*Company D*	*Company E*
Better Understanding	YES	YES	YES	YES	YES
Reduced Emissions	YES	YES	YES	YES	YES
Pollution Prevention	YES	NO	YES	YES	YES
Compliance Record	YES	YES	YES	YES	NO
Better Relationships	YES	YES	YES	YES	NO
Cost Savings	YES	NO	NO	YES	NO

10.4 Policy Implications

There are indications that some state and federal agencies are considering policies which use the ISO-EMS standard as a policy tool (Cascio, 1995). This study shows that the ISO-EMS should not be used to regulate chemical facilities in New Jersey. There are already programs which achieve similar goals and use similar methods as the international standard. Specifically, the New Jersey Pollution Prevention Act (N.J. ST 13:1D-41, 1990) not only requires the same type of planning process as planning an ISO-EMS requires, but has materials accounting and technical requirements for pollution prevention planning that go beyond that of the management requirements of an ISO-EMS. These requirements may prove more effective in achieving benefits such as pollution prevention activities, cost savings, understanding of environmental impacts of production processes, compliance record, and reduced hazardous emissions than the ISO-EMS requirements.

There are other compelling reasons why New Jersey should not use the ISO-EMS as a policy tool. For example, doing so would result in duplication of work already

completed since most companies already have some elements of an ISO-EMS in place. Also, ISO-EMS requires certification by an outside auditor which can cost upwards of $10,000. The companies that might benefit from implementing ISO-EMS because they do not have a comprehensive program, may not be able to afford to do so; any policy which required ISO-EMS certification could place smaller companies at a competitive disadvantage. The same would be true of any policy which favored ISO-EMS certification as proof of "good faith effort" to manage environmental issues.

If an agency wants an environmental management regulation, the ISO-EMS may not be the best model to use. As described earlier, an EMS which requires tracking of environmental costs may be more beneficial to companies. Further, the goal of continuous improvement replaced performance requirements in the ISO standard. However, continuous improvement may be difficult for firms who have greatly improved their environmental performance prior to undertaking ISO-EMS certification. Also, firms may reach the point of diminishing returns, where very small improvements have increasing costs making continuous improvement an inefficient goal.

10.5 Areas for Future Study

This study has contributed to the understanding of the benefits companies may achieve by implementing an ISO-EMS; however, other studies which use different methods might supplement this study. Study of a larger population, that includes large facilities without well-documented EMS, may yield different results. Also, evaluating physical characterisitics of facilities might affect the study outcome. This study did not account for

differences in facility setting, continous or batch processes or age of the facility, all of which could affect the study's outcome. Using different methods to evaluate the potential benefits might also reveal new insight.

Examining a different industry might provide different results, because the chemical industry has been placed under much scrutiny and reacted by creating industry-wide programs to improve its image and performance. Additionally, replicating this study in another state, with different environmental regulations, may prove companies elsewhere can achieve more benefits or benefit in other ways, than those companies in New Jersey. This would be particularly true for states that do not have programs which encourage pollution prevention planning.

Another area for further research is how, and if, environmental regulations should treat small companies differently than large companies. Small companies may not need an EMS to manage all of their environmental affairs, while large companies might. A study which focused on different EMS needs of large and small companies might reveal enlightening policy implications.

Finally, additional information about the benefits of, and methods to, integrate environmental management systems into an overall management scheme would be useful in understanding how to reduce impacts on the natural environment. Integration of environmental decision-making into every phase of production -- from planning to manufacturing to transport to disposal -- may be necessary to achieve more informed decision-making and improved environmental performance (Cohan and Gess, 1994/1995). Small companies, such as Company E in this study, may be the ideal model for

demonstrating this type of integration. For example, this company does not have an environmental, health and safety department. Instead, there is one person who focuses on this area, but is supported from persons in all other departments. This model may ensure that all employees are aware of the impacts of production on the natural environment and that suggestions for improvement are solicited from all divisions, not just those directly responsible for environmental management.

APPENDIX A RESPONSIBLE CARE®

The following information is a summary of the Responsible Care® program, as described by Morton Mullins of the Chemical Manufacturers Association (CMA) in Chapter 7 "Industry Perspective: Environmental Health and Safety Challenges and Social Responsibilities" of Kolluru (1994). The CMA initiated the Responsible Care® Program. All members of the CMA must uphold the ten guiding principles and six codes of management practices. The care program came about as public concern about chemical industry activities grew, forcing members of the industry to improve their environmental, health and safety performance and communicate more openly with the public. The first management practice was approved in 1989 and the last was in 1992. The six management codes are the basis for, or sometimes the only EMS initiative a facility has implemented. The six codes are:

•**Community Awareness And Emergency Response** - This code requires companies to communicate with the public about their operations and address their concerns. It also requires a joint program, with the community, for emergency planning and drills.

•**Distribution** - Companies must evaluate the risks of transporting their materials and products, and seek ways to minimize this risk.

•**Process Safety** - This code requires proper training for all workers, safety audits, inspections and maintenance programs to prevent fires, explosions or chemical releases.

•**Pollution Prevention** - Companies must reduce the amount of pollution and hazardous waste generated, and find ways to safely manage those which can not be eliminated, according to the management code.

•**Employee Health And Safety** - The code ensures proper training and information is given to those who work at and visit facilities. It also requires that hazards be reduced by using appropriate equipment at all times.

•**Product Stewardship** - Member companies are expected to work with their suppliers, distributors and customers to ensure that no harm comes from transport, use or disposal of their products or waste products.

The Management practices must be audited, and companies are expected to evaluate and work to improve their program, once it has been put into place. The CMA also has a pilot program, in which outside auditors evaluate a companies efforts to implement the codes.

One final aspect of the Responsible Care® program is the community awareness program. Aside from developing emergency plans with the community, many plants have established community advisory panels. These groups have plant representatives, facility neighbors, local officials and environmentalists as members. They work together to discuss concerns of neighbors and educate them about what occurs in the plans, what are the risks and what can be done to prevent them.

APPENDIX B INTERVIEW QUESTIONS

This interview will consist of three parts. The first set of questions are questions pertaining to the characteristics of the facility and company. The purpose of the second set of questions is to gain a clear understanding of the present Environmental Management Program, and the forces which have shaped it. The third set of questions are geared towards measuring the success of the Program: has it actually improved environmental performance and overall efficiency.

Part I:
General Questions

1) Are you ISO 9000 certified?

2) How long has your facility had an EMS in place?

3) What caused the decision to implement an EMS?

4) Is your EMS based on TQEM?

5) If not, what type of mechanism is in place to ensure continual improvement?

6) How has your EMS changed over time? Is it now based on New Jersey Pollution Prevention Guidelines or ISO 14001?

7) When the EMS was first implemented, how did the corporate culture/individual attitudes react to environmental issues?

8) How has corporate culture/individual attitudes changed since that time? Why?

9) Can you think of any examples of how these changes in attitude have affected corporate environmental performance?

10) Do you think international standards are important, for your company?

11) In your opinion are standards beneficial or harmful? Why?

12) At what stage in ISO 14001 certification are you? Considering it, planning for it, certified? If NA, skip to 15.

13) Are other facilities within your corporation at the same stage? If not, do you know at what stage they are at?

14) What factors influenced the decision to prepare for certification at this facility? Is it a local or corporate decision?

15) Did your facility appreciate the flexibility of the New Jersey Pollution Prevention Act, which required Pollution Prevention planning, but not implementation?

Part II: The Environmental Management Program
The questions from this section have been devised based upon the ISO 14001 requirements and the guidelines of the New Jersey Pollution Prevention Act. Volunteering any information regarding how and why certain elements of the program have changed, even when not specifically asked, would be beneficial. For example, if an element was revised to meet ISO requirements or parent company goals, it should be noted.

Environmental Policy

1) When was the original environmental policy drafted?

2) Who was involved in the process? Only the EH&S staff or many departments?

3) How often is the policy revised? Who decides when revisions are needed? Who drafts revisions?

4) Have revisions been made to reflect requirements of the New Jersey Pollution Prevention (New Jersey Pollution Prevention) Act?

5) Have revisions been made to reflect requirements of ISO 14001?

6) How is the environmental policy communicated to employees? How often is it reiterated or stressed?

7) How is the environmental policy communicated external to the plant? Is it shared with corporate headquarters? Stock holders? Other facilities? Has the policy been shared with the surrounding community?

8) Is there commitment from top management to upholding this policy? How is it demonstrated?

Planning
1) What procedure exists to identify potential environmental impacts resulting from operations?

2) What are the criteria used to identify significant impacts (those which should be reduced)? Have these changed to be in conformance with ISO 14001 or NJ Pollution Prevention Act?

3) Is this procedure followed for all "production lines" or business activities within this facility? Or is it applied only to new ones? Has this policy changed to reflect conformance with ISO 14001 or New Jersey Pollution Prevention Act?

4) What procedure is used to track legal requirements? Who is responsible for this task?

5) What objectives and targets have been established by the environmental management program? In your opinion, are these aggressive goals? Can they be accomplished in the time frame allotted?

6) What type of data is collected to determine objectives and targets? Has this process been influenced by ISO or New Jersey Pollution Prevention Act requirements?

7) Have your achieved any of your objectives? If not, how close are you to achieving those goals?

8) What happens after one goal is achieved? Are new ones established?

Environmental Management Program

1) Who is responsible for the environmental management program? Where do they fit into the corporate (and facility) hierarchy?

2) Are sufficient resources dedicated to the program, including financial, human resources, technical, etc.? How has this changed since the program was first initiated? Has top management commitment to the EMS grown stronger over time or declined?

3) How often is the environmental management program reviewed and revised? What changes have been made? In response to what stimulus? Who is responsible for it?

Training

1) Is there a company-wide general environmental education program or are employees trained specific to their position?

2) Are there incentives for employees to make environmental tasks a priority within the standard business procedures? For example, is environmental performance included in standard review? Are bonuses based on environmental efforts?

3) Are there any means for recognizing environmental efforts, which go beyond one's job description? Is there a program for recognition of special projects?

3) What percentage of time do most plant managers spend working on environmental endeavors?

4) Are employees who work in operations informed of potential risks and well-trained in independent procedures?

Environmental Management Program Documentation

1) Is there a manual describing all aspects of the environmental management program?

2) Who has copies of the manual and where are they kept? Are they accessible to all employees?

3) Describe the documentation system and how it has changed to reflect New Jersey Pollution Prevention Act/ISO 14001.

4) Who is responsible for the documentation system?

Operational Control

1) What type of *system* is in place to monitor/measure environmental performance? How long has it been in place and what changes has it undergone recently?
Can you give me any examples.

2) How often are measurements taken and assessed against pollution prevention goals/goals of the EMS?

3) Please describe the units of measurement, are they in dollars, pounds or ratio of pounds per unit of output?

4) Is this data used strictly for reporting purposes or is it used in decisions regarding capital investments and other business decisions?

5) Did this system change in response to requirements of New Jersey Pollution Prevention Act?

6) Are these results assessed against corporate company policy? If so, how often?

7) Describe procedures for handling "non-compliance" issues. Who is responsible for it?

8) What types of compliance records are kept? Has this process changed in recent years?

9) Do you perform internal environmental management system audits? If so, how often and why? What types of decisions are made based upon audit results?

Part III: The third set of questions relate to operations and will attempt to help understand the success and results of implementing an EMS.

Environmental Performance

1) Can you describe your pollution prevention efforts? Can you give examples?

2) Have you made process changes to reflect these goals?

3) Have you had fewer incidents of noncompliance with state and federal statutes, as a result of implementing an EMS?

4) Have you discovered and been able to reduce fugitive emissions?

5) Have you saved dollars?

6) Have you done material balances, as described in the New Jersey Pollution Prevention Guidelines? Do you have flow charts of processes? If so, can you give any examples of how these data has been used to make decisions?

Accounting Methods

1) Can you describe any changes that you have been made in accounting methods? For example, are environmental costs attributed to each production line or are they attributed to overhead? Are costs such as disposal of hazardous waste viewed as fixed or are they able to be reduced? If so, what was responsible for this change?

2) Have purchasing patterns of hazardous materials been changed as a result of your pollution prevention plan or ISO 14001 audit? Or another program?

3) Have prices been adjusted to reflect environmental costs incurred or saved?

Products

1) Have products been reformulated to reflect environmental goals? If so, what goals have been achieved?

2) Are life cycle analysis or design for the environment methods used to analyze new products or to evaluate current ones?

Community Relations

1) Has your relationship with customers or contractors/suppliers changed since you implemented EMS? Please describe how.

2) Do you have a better relationship with those you do business with/ interact with in the community? Are you more or less welcomed in the community?

3) How have you publicized your pollution prevention program to those you interact with?

4) Has your company public image improved? If so, have you seen obvious benefits from this image enhancement?

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