2007

Assisting small and medium enterprises establish procedures for verification, management review and continual improvement of ISO 14001

Parimala Anthony

Rochester Institute of Technology

ASSISTING SMALL AND MEDIUM ENTERPRISES ESTABLISH PROCEDURES FOR VERIFICATION, MANAGEMENT REVIEW AND CONTINUAL IMPROVEMENT OF ISO 14001

By Parimala Anthony

2007

Graduate Thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Environment, Health and Safety Management

Department of Civil Engineering Technology,
Environmental Management & Safety
Rochester Institute of Technology
Rochester, NY

Approved By

_____ _____

Maureen Valentine, PE, Department Chair Date

_____ _____

John Morelli, Ph.D., PE, Professor Date

REPRODUCTION PERMISSION STATEMENT

ASSISTING SMALL AND MEDIUM ENTERPRISES ESTABLISH PROCEDURES FOR VERIFICATION, MANAGEMENT REVIEW AND CONTINUAL IMRPOVEMENT OF ISO 14001

By Parimala Anthony

I, Parimala Anthony prefer to be contacted each time a request for reproduction of my graduate thesis is made. If permission is granted, any reproduction will not be for commercial use or profit. I may be reached at the following address:

16A Hillcrest Road,
Burlington, MA – 01803.

Signature: _____ Date: _____

ACKNOWLEDGEMENTS

I would like to thank Professor John Morelli, my advisor, for his direction and continued advice throughout this project. I would also like to thank the Department Chair, Maureen Valentine, Professor Jennifer Schneider, and Professor Julie Potter for their continued support.

I am thankful for my husband and daughter for their patience and understanding.

Finally, I would like to thank my parents, for their encouragement to pursue what I've chosen to do throughout my life.

TABLE OF CONTENT

LIST OF TABLES:

CHAPTER 1

ABSTRACT

This study addresses the issue of reaching small and medium-sized enterprises (SMEs) with appropriate means to help them establish procedures for verification, management review and continual improvement in accordance to the ISO 14001 Environmental Management System (EMS) standard.

The relative contribution of SMEs to the total industrial environmental impact is unknown, but it is likely to be considerable, given their contribution to total production and their dominance in sectors such as information technology, electronics, metals, printing, textiles etc. Therefore, the role of SME's in protecting and improving the environment, through their production and marketing of environmental technologies (for energy efficiency, waste minimization, renewable energy etc.) is likely to be significant.

Considering the dynamics of supply chain management, the future contribution of SMEs to improving society's "eco-efficiency" through innovation is also likely to be substantial. Most SMEs perceive environmental improvement as a costly burden. As they are primarily concerned with short-term economic survival, they are not motivated to ask for, or use, environmental information or support. However, the substantial financial earned by some SMEs adopting "clean production" have indicated that action on the environmental performance of the business has improved their market share and profitability. SMEs in the business of supplying environmental technology would be on the preference list especially in the global market.

ISO 14001 is difficult for SMEs to understand, adopt or use as they face problems that could be classified into three categories:

1. **Internal Obstacles:** such as lack of a formal environmental management plan, documented policies concerning environmental matters, understanding the regulatory and legal requirements of ISO 14001 standard in addition to the requirements of the standard itself, financial resources to implement complicated

processes which may have beneficial environmental impacts, lack of understanding the importance of audits and most importantly lack of leadership.

2. **External Obstacles:** such as increase in environmental regulatory and legal requirements and lack of financial assistance to be able to hire external consultants or utilize the expertise of business sector associations.
3. **Standard:** The ISO 14001 guidelines are not user friendly as it does not offer guidance on ensuring compliance with regulatory and legal requirements which may mean that interpretations made by the certified bodies are more restrictive than the in-house team of experts at the company.

As a result, it was found that SMEs need four types of information:

1. Help and advice with environmental problems, concerning compliance and their solutions;
2. Tools for better environmental management and general management;
3. “Success Stories” and experiences that are specific to their sector;
4. Trends and scenarios about future marketing opportunities.

This study tends to meet the need for information about management tools, focusing specifically on the verification, management review and continuous improvement aspects of the ISO 14001 Environmental Management System.
The study emphasizes the role of large organizations in providing most of the motivation and help in implementing the standard. The particular role of large organizations could vary from facilitator, to being an information provider or service provider.

CHAPTER 2

INTRODUCTION

Small and Medium Enterprises or SMEs are companies whose headcount or turnover falls below certain limits. According to the European Union or EU the current definition of an SME categorizes companies with fewer than 50 employees as “small’ and those with fewer than 250 employees as “medium”. By contrast, in the United States, when small business is defined by the number of employees, it often refers to those with less than 500 employees. However, the most widely used American definition of micro-business by the number of employees is the same of that of EU. [1]

In the global market, companies realize that business is not just about selling products and services. Global citizenship is assuming responsibility to protect the environment that is just as important, not only to earn customers' trust but to comply with regulatory requirements. [2]

Most large businesses operating in global markets have established management systems both in the field of quality and environment. As European, Asian and South American countries and their consumers embrace the concept of a global environmental management standard, the advantage of certification may become more apparent to United States (U.S.) companies. [3] In the U.S., a second industry segment consists of manufacturers who supply to large U.S. corporations that are themselves certified to ISO 14001. For e.g., he Ford Company embraced the ISO 9000 and set up a company specific QS 9000 system. They then mandated that their suppliers become certified too. A likely approach was adopted with respect to ISO 14001. In order to remain competitive in the marketplace many of these organizations require their suppliers to incorporate Environmental Management Systems (EMS) into their business processes, or give preference in procurement to those who do. A major manufacturer such as the Ford manufacturing division would require this for several reasons. The certification demonstrates environmental responsibility. This attribute could be an important discriminator for businesses seeking to select their supplier pool to the best in quality,

price, responsiveness and certainly environmental management. This makes the supplier to be more dependable as the supplier does not pose environmental liabilities to itself or the buyers of its products. [4]

With increase in globalization, some domestic companies may plan to enter the international markets in the future. They believe that having a certified ISO14001 EMS will lend credibility in the international marketplace. At present there is an increasing need to be environmentally conscious along with providing quality products and services to the customer. More companies have indicated that they are aware that effective environmental management systems can reduce waste generation and pollution and their associated costs, but that they never find the time to figure out what is involved and just how to put one in place. While relatively large organizations could allocate portions of their budgets to these activities, it would be difficult for SMEs as they operate on a smaller budget. In addition, time is also a crucial concern to the SMEs.

This study reviews the workings of EMSs in large organizations. Some SMEs in Monroe County who are ISO 14001 certified are observed for similar activities, in order to identify the most effective way to establish procedures for verification, management review and continual improvement aspects of ISO 14001. Being an Environmental Health and Safety [EHS] Management Student, this study enables me to learn more about the drivers for better EHS performance. It also provides an insight to the importance given to EHS in the industry.

CHAPTER 3

PROJECT DESCRIPTION

ISO 14001 Certification Nicole Darnall George Mason University offers a conceptual framework that explains why parent companies would mandate, rather than simply encourage their operational units to certify to ISO 14001. [5] The framework was tested using survey data of corporate environmental managers. The results show that firms that have a central role in nearly half of all facility-level certifications and that firms that mandate ISO 14001 endure greater external pressures and have stronger complementary resources and capabilities that support their organization-wide ISO 14001 policies. Some of these external pressures are:-

International Business Food Chain

The SMEs in Monroe County were studied as the target audience in this study. Unlike businesses in Europe, most SMEs in the Monroe County do not consider themselves to be a part of the international business food chain and consequently see little reason to invest in the costly and labor intensive development and implementation of ISO 14001 EMS Standard.

However, with increased competition in the global market, more large firms like Ford Motor Company, General Motors, and DaimlerChrysler are making it a requirement for suppliers to be ISO 14001 certified. [6] [Legacy Elsmar Forum Admin – October 1 1999] The automobile industry position was summarized in remarks made by Harold R. Kutner, group vice president of Worldwide Purchasing and North American Production Control and Logistics for General Motors. GM will require its suppliers to implement an environmental management system by December 31, 2002. said Kutner, "Working together with our suppliers, we can accomplish much more to improve the environment than GM can alone accomplish. We believe it is in all our interests to make improvements in the environmental arena."

According to Dennis Manino, GM vice president for environment and energy, and Chief Environmental Officer, "This commitment to high environmental performance throughout

our entire business is not new, but this requirement further enhances our partnership with our suppliers and is a natural step toward our drive to environmental stewardship."

Hence the ISO 14001 certification is critical for SMEs catering to the automobile industry to remain in business. This requirement could spread across industry as ISO 14001 EMS serves as a framework for companies to meet environmental challenges and regulations. Although adherence to ISO 14000 is voluntary, the U.S. Environmental Protection Agency (EPA) supports the use of EMS to help organizations improve their environmental performance. [7]

Government Recognition and Incentives

According to the Quality Digest Article *"ISO 14000: A Status Report by Joe Cascio and Gregory J. Hale"* [8] ISO 14000 also has captured the attention of at least one public official. In October of 1996, New York State Attorney General Dennis Vacco called on Brookhaven National Laboratories, one of the Department of Energy's key nuclear facilities, to implement an ISO 14001-environmental management system before he would recommend reopening the site for business. After a 15-month investigation following Brookhaven's release of tritium-contaminated water from the lab's sewage treatment plant into the Peconic River, Vacco's office determined that the laboratory needs a structured environmental management program in place to reduce the possibility of future releases. In the United States, representatives from several federal agencies and more than 15 states are working through various initiatives to determine if and how ISO 14001 could be integrated into the regulatory enforcement structure. While it may be years before the U.S. Environmental Protection Agency formally allows states to use ISO 14001 in creative approaches, several states, including New Hampshire, Pennsylvania, California, Wisconsin and North Carolina, are working closely with industry to foster a new relationship through ISO 14001 implementation and registration.

Efficiency and Economics

Finally, the positive correlation between implementing an EMS as reducing pollution, increasing production efficiency, and avoiding unnecessary regulatory fines, fees and assessments is well evidenced in the professional literature. Progressive companies have embraced the concept of pro-active pollution, prevention, sometimes referred to "source reduction," to reduce pollution by addressing the problem over the life cycle of the product or service[9]. The continual improvement element of the ISO 14001 EMS fosters such improvements at all stages of the life cycle. An effective EMS helps an organization identify the caused of environmental health and safety problems and eliminate them, saving money by reducing waste, increasing efficiency and reducing the costs associated with environmental compliance and liability. Hence it leads to the hope that an EMS offers the potential to improve an organization's overall environmental performance, especially through pollution prevention and improved compliance. [10]

CHAPTER 4

GENERAL STATEMENT OF THE PROBLEM

The primary objective of the study was to identify and develop a procedure for verification, management review and process for continual improvement. This includes,

1. Monitoring and Measurement: This involves determining and monitoring key activities and tracking corresponding performance as well as conducting periodic assessments of compliance with legal and other requirements like good management practices, quality etc.
2. Corrective and Prevention Action: This includes the identification and correction of problems and prevention of their occurrence;
3. Record Keeping: This includes maintenance and management of EMS performance records and
4. Management Review: Periodically review EMS with an eye for continual improvement, which includes:-
    a) How to conduct a management review
    b) Evaluating audit results
    c) Continuous improvement decisions

    The approach comprises of the following steps:-

        i) Identification of SMEs that are already ISO 14001 certified to learn the process they went through;
        ii) Review established guidelines for implementing ISO 14001 standard;
        iii) Compare the data collected by the SMEs with the standard; and
        iv) Provide recommendations that could be adopted by SMEs striving towards ISO 14001 Certification.

CHAPTER 5

I] BACKGROUND: ISO 14001 AND ITS ELEMENTS

ISO 14001 is a series of environmental management standards developed by the International Organization for Standardization, commonly known as ISO (derived from the Greek word *isos,* meaning equal). It is aimed at promoting continual improvement in environmental performance through the adoption and implementation of an environmental management system. The standard specifies the core elements of an EMS, but contains only those elements that may be objectively audited for certification or self – declaration purposes.

The ISO 14001 standard requires that an organization puts in place and implements a series of practices and procedures that, when taken together, results in an EMS. ISO 14001 is not a technical standard and as such does not in any way replace technical requirements embodied in statutes or regulations. It also does not set prescribed standards of performance for organizations. [11]

The ISO 14001 defines an overall environmental management system, closely modeled on the ISO 9000 quality systems standard, and covers the following core elements:

1. **Establishment of an appropriate environmental policy** that is documented and communicated to employees and made available to the public, and which includes a commitment to continual improvement and pollution prevention, regulatory compliance and a framework for setting objectives;
2. **A planning phase** that covers the identification of the **environmental aspects** of the organization's activities, identification and access to legal requirements, establishment and documentation of objectives and targets consistent with the policy, and establishment of a program for achieving said targets and objectives (including the designation of responsible individuals, necessary means and timeframes);
3. **Implementation and operation of the EMS** including the definition, documentation and communication of roles and responsibilities, provision of appropriate training, assurance of adequate internal and external communication,

written management system documentation as well as appropriate document control procedures, documented procedures for operational controls, and documented and communicated emergency response procedures;

4. **Checking and corrective action procedures,** including procedures for regular monitoring and measurement of key characteristics of the operations and activities, procedures for dealing with situations of non-conformity, specific record maintenance procedures and procedures for auditing the procedures for auditing the performance of the EMS;
5. **Periodic management reviews of the overall EMS** to ensure its suitability, adequacy and effectiveness in light of changing circumstances.
6. **Continual Improvement** process is structured into the EMS outlines by the ISO 14001. The rate and extent of the same is determined by the organization in light of economic and other circumstances.

It should be understood that the EMS is a tool which enables the organization to achieve and systematically control the level of environmental performance that it sets itself. The establishment of an EMS will not, in itself, necessarily result in an immediate reduction of adverse environmental impact. Indeed care needs to be taken that the mere establishment of an EMS does not bring the organization into a false sense of security. [12]

II] Review of the Literature

The need for this work is evident in the literature and most aptly stated as follows:
The literature published on EMSs is substantial and includes the ISO 14001 standard and numerous papers, journals, and books covering EMS development, evaluation and review. However, these literature sources provide little insight into how to initiate an EMS with minimal resources [13] Some of the barriers SMEs' face include:

- lack of awareness and/or denial that they cause significant environmental impacts , resource constraints (including financial, time and personnel) ;
- lack of incentives ; inappropriate tools and techniques and a lack of skills, and
- lack of guidance and support on how to implement an EMS that would meet the requirements of ISO 14001 [14]

In virtually every case the guidelines for developing an EMS point to the crucial need for management support, but little is provided in the way of "how" to develop that support.[15]

1. The Standard

ISO 14001 helps organizations to comply with environmental law and manage the environmental impacts and risks of their activities. It is an International Standard for 'Environmental Management Systems'. It is published by ISO, the International Organization for Standardization. It does apply to all types and sizes of organization in the world. [16] About 30 000 organizations have achieved Registration to ISO 14001. With pressure from governments and leading companies, Registration is foreseen to grow to hundreds of thousands of organizations. The intent of the ISO 14001 is that it contains management principles to help reduce the risk to the environment of your operations and products. This includes environmental policy and objectives, training and organization of people, measurement of performance, and planning for emergencies. [*Refer Annex II: Strategic Environmental Management and Continual Improvement*]

2. **Potential benefits of an EMS based on ISO 14001**[17]`

- Improvements in overall environmental performance and compliance

- Provide a framework for using pollution prevention practices to meet EMS objectives
- Increased efficiency and potential cost savings when managing environmental obligations
- Promote predictability and consistency in managing environmental obligations
- More effective targeting of scarce environmental management resources
- Enhance public posture with outside stakeholders

U.S. EPA is interested in promoting and testing EMSs under ISO 14001. EPA believes EMSs, if implemented properly, could serve as a valuable tool to help organizations improve their environmental performance, increase the use of pollution prevention, and improve compliance. However, this premise needs to be evaluated closely, working with a variety of organizations, including those in the public sector. EMSs could, in the future, serve as the basis for providing regulatory flexibility to organizations that successfully implement them.

3. **The EMS Implementation Process: [Refer Annex III: Process for Establishing Environmental Management System]** [18]

   a) The **establishment of an Environmental Policy** mandated by top management, and verified by them during Management Review, is the first requirement of the Standard. The Policy sets the tone for the establishment of EMS principles. The Policy directs corporate goals, corporate responsibilities, and the establishment of corporate performance milestones against which the management system must be judged. Top management is held responsible for the initiation of Policy and for providing direction for others who may be tasked with the development of the final Policy itself. The Policy should account for the following:

      i) Reflect the moral and ethical basis for the organization's actions.
      ii) Account for regulatory/self-imposed requirements.
      iii) Stress commitment to continual improvement.
      iv) Provide coordination to other organizational policies.
      v) Provide attachments to requirements, internal and external.

vi) Be consistent to the operation's products and services as they impact the environment.
vii) Be clear, concise, and implemented at all levels of operations.
viii) Be publicly available.
ix) Strive toward prevention of and continual reduction of adverse environmental effects, thus supporting sustainable development.
x) Set and allow for publication of environmental objectives and targets, improvement plans and management reviews.
xi) Satisfy the requirements of concerned third parties such as insurance companies, banks, shareholders, etc…
xii) Be updated and checked routinely.

b) **Environmental aspects** are those elements of an organization's activities, products, services or physical resources which *may* have potentially beneficial or harmful effects on the environment. These may include discharges and emissions, raw materials and energy use, waste recycling, noise, dust, and visual pollution.

i) An **environmental impact** is the change that takes place from the occurrence of any given *aspec*t. An impact is the pollution that would result if an environmental aspect were not properly managed or controlled.
ii) The relationship between the two is causal:
- Aspects include technical concerns such as potential process, storage, transfer, transportation, utilities, and product impacts. Impacts include emissions to air, water, hazardous waste, soil and groundwater, energy use, material use, cosmetic and nuisance concerns.
- Aspects are reviewed at the level of the site, plant, department, installation and process. Complaints from third parties should be included in the development of a list of aspects. Some of the aspects will not be regulatory requirements.

iii) A procedure to identify legal requirements of the organization should be established and maintained. This includes all laws and other self-imposed requirements to which the organization adheres. These requirements can be partially established by reviewing the previously completed aspects and impacts. Considerations here include asking how the organization identifies, tracks and accesses legal requirements. How are changes in these requirements tracked? How are employees and others, such as subcontractors and suppliers, informed of any changes in legal requirements?

c) **Objectives and Targets** are where you shift from identifying your environmental aspects and impacts to developing a plan to improve them. Objectives and targets are established to meet the goals of the organization's environmental Policy. Objectives and targets are developed from the results of environmental Aspects development. They must be developed within the scope of the environmental Policy, and should quantify the organization's commitment to environmental improvement with time. SME must be aware of the fact that, the firm operates in a closed economic system. Therefore they need to consider the financial, operational and business limitations of the organization.

   i. Typically, environmental objectives are overlapping considerations such as the development of better employee education and training, improved communication with other interested parties, EMS development and registration.
   ii. Environmental Targets are traditionally specific items like the reduction of energy utilization 10% in a year, or the reduction in hazardous waste generation 3% over three years. Targets are more closely related to measurable events and might be directly identified as cost reducing. Objectives are more philosophical and general.

iii. To ensure that these Targets and Objectives are accomplished, an **Environmental Management Program (EMP)** is designed. Once the organization establishes its environmental Objectives and Targets, then planning begins to develop a Program for achieving them. This Program should be integrated into the existing environmental management practices at the organization wherever possible, and should be tied into the strategic plan of the organization as well. Issues such as scheduling, resource allocation, and responsibilities should be included in the Program to allow for the successful achievement of the Objectives and Targets.

d) For an EMS to be effective, **individual roles and responsibilities must clearly be defined** as they relate to the achievement of environmental Objectives and Targets, and the overall operation of the EMS. Top management must supply the necessary resources, both financial and staff, to ensure that the EMS is effectively implemented. They are also responsible for appointing a Management Representative (MR) to oversee the operation of the EMS. Organizational structure should be defined in writing. An **organizational chart** would be helpful for illustrating many of the environmental responsibilities that must be addressed. Specifically, key personnel should be clearly identified in the organizational structure such as:

- Management Representative (MR)
- Director EH&S (or that person responsible for executive decisions of an environmental nature)
- Facilities Manager
- Plant Environmental Coordinator (EC)
- Purchasing Agent(s)
- Production Manager(s)
- R&D Manager

e) **Training, Awareness and Competence:** Management has an essential role in developing organizational awareness and motivation by explaining environmental Policy and demonstrating commitment to it. This commitment of individuals and resources to the goals outlined in the environmental Policy, Targets and Objectives is the event that brings the EMS to life.

Training is important for two reasons:

i. Employees are a useful resource for generating ideas about establishing operational control for a process, defining environmental aspects, or defining structural responsibilities.
ii. Employee action might have an impact on the environment.

f) **Communication** in an EMS includes the communication of internal and external environmental information to management, and the communication from management to others of their intentions regarding environmental impacts. Communication should include procedures for internal reporting as well as external reporting on environmental activities of the organization. This communication would be designed to:

i) Demonstrate management' s commitment to the environment;
ii) Make others aware of the organization' s environmental policy and commitment to environmental responsibility;
iii) Address concerns about the organization' s environmental activities by external parties;
iv) Announce the organization's strategic environmental management approach; and
v) Establish a line of communication that clearly defines emergency responsibilities.

g) Documentation: Once the organization establishes its environmental Objectives and Targets, then planning begins to develop a Program for achieving them. This Program would be integrated into the existing environmental management practices at the organization wherever possible, and would be tied into the

strategic plan of the organization as well. Issues such as scheduling, resource allocation, and responsibilities should be included in the Program to allow for the successful achievement of the Objectives and Targets.

h) **Document Control:** Documenting an EMS could be as simple or as complex as the organization decides. EMS documents would be integrated with other management documents wherever possible. Cross-references with health and safety manuals and quality manuals are examples of this. Existing Procedures manuals may have environmentally related information in them. Operational processes and procedures would be defined, documented and updated, especially those that establish operational control over significant environmental aspects. The EMS Manual is a road map to other associated documents. The EMS Manual would describe what the EMS consists of, where other related documents are located, and where records of performance can be found. It should be a “one-stop-shopping” outline of all other sources of EMS paperwork.

i) **Operational control** over all activities *significantly* affecting the environment is a requirement of the ISO 14001 Standard. To assure this, operating methods and procedures must be written down for these activities. This provides consistency when staff changes occur, and clearly identifies to staff members what their job responsibilities are. Specific *documented* instructions must be developed for those activities where absence of instructions might result in a non-conformance or a high risk of environmental impact. In those cases, written instructions must clearly and succinctly provide operating procedures, performance verification criteria and any corrective activities required in the event of a non-conformance. Master lists should be developed to control the existence, location and ownership of each procedure. These master lists may become bridge documents for the development of “operational control” as indicated in the Standard.

j) **Emergency preparation and procedures** would be established to respond to unplanned events. Procedure would define control mechanisms, operational

requirements and other controls during these events. Emergencies, as defined by an EMS, include releases to the environment of all types, natural disasters that might lead to releases, and process hazards that might become emergencies. Emergency preparations for most facilities are usually based upon human health considerations, as they should be. There is a good possibility that health and safety programs have been established which may comply with the standard. They should also include procedures for mitigation of material loss or other financial damages resulting from emergencies.

k) **Measuring and monitoring**, are performed to see if the EMS Targets and Objectives are being met. The Environmental Management Program establishes Operational Control performance criteria that must be verified. The EMS should include procedures for this measuring and monitoring. The results of this self-critical analysis should be reviewed and used as indicators of the system' s success and reliability, as well as identifying those areas in need of Corrective Action or improvement.

l) **Nonconformance and Corrective and Preventive Action:** The results of Monitoring and Measurements, audit findings and other systemic reviews should be documented and reviewed, and must lead to Corrective Actions. Procedures should be in place so that the organization can ensure that Corrective Action has taken place, and that it has been effective. Further, the root cause of the systemic failure should be determined, if possible. And, patterns and trends should be noted and analyzed.

m) **Records** are required to demonstrate compliance with the EMS. They should be collected within the framework of the EMS, and they should record the extent to which the EMS design is performing. Procedures should be developed to maintain, identify, collect, index, and store records. Included in the records being maintained by the system should be contractor, procurement, audit, management review, and training records necessary for the confirmation of the EMS. Records

should be legible and identify the activity, product, or service involved. Records should include details of non-conformance and corrective actions, records of regulatory violations and corrective actions, incident reports and follow-ups, complaints and responses, supplier and contractor information, inspection and maintenance records, MSDS, and monitoring data. Records management under an ISO 14001EMS must be able to prove that the organization is actually doing what it says!

n) An EMS must include a **routine systems audit**. This audit would determine compliance with the ISO 14001 EMS, and may also be combined with regulatory compliance audits, quality audits, energy audits and other forms of management inquiry if so desired. The requirements of ISO 14001 do not require compliance with regulations, but they do require the commitment to compliance and routine monitoring of your compliance status. As a result, compliance is more closely related to EMS auditing than quality auditing.

Whether or not internal or third party auditors are used, they should possess the qualifications outlined in ISO 14012:

i) Expertise in environmental science and technology.
ii) Expertise in the technical and environmental aspects of facilities operations.
iii) Expertise in environmental law, regulations.
iv) Expertise in environmental management systems.
v) Expertise in EMS auditing techniques.

These qualifications are *essential* for auditors. An auditor should be registered with a recognized environmental auditor certification scheme such as the ANSI/RAB * in the United States. Without the above areas of expertise, the systems audit will NOT yield operational information that will be useful for the achievement of continual improvement.

o) **Management Review** is an essential portion of the continual improvement of the organization's EMS. The improvement process does not end with the

ISO 14001 – Its effect on Small and Medium sized Enterprises:

The trade and environment debate has highlighted the special conditions of small and medium-sized enterprises (SME) in responding to environmental challenges. At the same time, it may be possible for SME to achieve significant environmental improvements through better housekeeping practices, provided the appropriate supporting infrastructure is in place. In this context, it is important to examine the role of EMS in enhancing the environmental management of SME in a cost-effective manner, as well as the special conditions and needs of SME in establishing an EMS. An example of an aid to the SME sector is the establishment of the Eco-Management and Audit Scheme (EMAS) – European Union's (EU) initiative towards Sustainable Development [19].

[20]The EMAS established a management tool for companies and other organizations to evaluate report and improve their environmental performance. The scheme has been available for participation by companies since 1995 (Council Regulation (EEC) No 1836/93 of 29 June 1993) and was originally restricted to companies in industrial sectors. It is an established fact however, the effect how the industry sector financial system relates with the economic status of any country.

Since 2001 EMAS has been open to all economic sectors including public and private services (Regulation (EC) No 761/2001 of the European Parliament and of the Council of 19 March 2001). In addition, EMAS was strengthened by the integration of EN/ISO 14001 as the environmental management system required by EMAS; by adopting an attractive EMAS logo to signal EMAS registration to the outside world; and by

considering more strongly indirect effects such as those related to financial services or administrative and planning decisions.

Participation is voluntary and extends to public or private organizations operating in the European Union and the European Economic Area (EEA) — Iceland, Liechtenstein, and Norway. An increasing number of candidate countries are also implementing the scheme in preparation for their accession to the EU.

Under EMAS, the particular difficulties SME may encounter have been explicitly recognized. Thus, SME in the European Union benefit from special assistance to facilitate their participation in EMAS. This includes information, training, and technical support. SME may also benefit from a simplified system of verification and inspection, as well as an exemption from having to produce annual environmental statements.

EMAS and ISO 14001 – a perspective

So far, ISO has not recognized a need to develop a special EMS standard or provided any exemptions for SME. However, an ISO task force has been established on ISO 14000 and SME. The task force has considered several country case studies.
Most of the Latin American studies found majority of the suppliers to the domestic market to be SME. Being a player in the domestic market did not pose a challenge in the context of environmental performance prior to the 21st Century. Awareness of the existence of ISO 14000 was found to be very low, and commercial pressure to implement an EMS almost non-existent.

Dr. Gino C. Bianchi, Geomatrix Consultants, Inc. has more than 16 years of experience in environmental engineering projects in the U.S. and Latin America, including due diligence assessments and regulatory negotiations. [21]According to the research conducted by Dr. Gino on Latin America's Environmental Regulation and Compliance - Latin America is in an economic transition characterized by a reduction in trade barriers and increased privatization. Coupled with the growing awareness of environmental protection issues, has led to increased environmental regulation and environmental

business opportunities only in the early 21st Century. Latin American citizens are increasingly demanding more stringent environmental protection on local, regional, and global levels. This motivated most SME see for taking environmental measures.

[22]The findings of a study on SME in South Wales, United Kingdom, are very similar. Most studies confirm that SME face specific problems in establishing EMS. Lack of financial resources and qualified personnel, difficult access to information, resistance to change, related costs of setting up the system and certification are major constraints for SME. A recurrent theme is the lack of trained environmental personnel. SME personnel state that the link between environmental performance and business performance is not being made as well as it could be in the ISO 14001 standard. As a result studies also show that very few SME have an environmental policy in place and that SME face particular difficulties with the comprehension and interpretation of ISO 14001, with the identification of environmental legislation, and with the identification of environmental aspects and impacts of their activities. The most successful EMSs appear to be those developed by organizations (principally large) using their own internal resources - but this is not a luxury many of the SMEs have.

[23]Europe's Eco-Management and Audit Scheme [EMAS] studies state another major obstacle is the voluntary nature of ISO 14001. Most SMEs tend to react to an initiative when there is a mandatory requirement to do so by a regulatory authority. Implementation of the standard being voluntary, there is no perceived pressure on the company to do so internally. Enforcement of regulation thus is a major motivator for SME to start thinking about ISO 14001. However, the lack of knowledge and cost of certification are still obstacles to this trail of thought.

In the short run, the implementation of EMS by SME will depend largely on demands by large organizations, e.g. customers in overseas markets, in particular subsidiaries imposing requirements on local suppliers. This is more so as many subsidiaries of Large Organizations who play a major role in the supply chain management are located in the third world countries. Though regulations exist in the third world countries,

enforcement of these regulations is very relative to the dynamics of the market and political system.

Large organizations, however, can assist SME in complying with the requirements of ISO 14001. Xerox Corporation is a $15.7 billion technology and services enterprise that helps businesses deploy smart document management strategies and find better ways to work. Headquartered in Stamford, Connecticut, Xerox is No.130 among the Fortune 500 and has 61,100 employees worldwide, including 35,600 in the United States (December 2003).

[24]Xerox made an early commitment to register their manufacturing sites worldwide to the ISO 14001 environmental management standard. Since 1998, Xerox has asked its materials and components suppliers to meet specific environmental, health, and safety requirements. The requirements, updated in 2003, are part of the company's supplier assessment program and form the basis for competitive assessments. Xerox's primary contract manufacturer for office products, Flextronics International, was also required to comply with strict standards for product safety. Any modifications to Flextronics' product manufacturing process, including parts substitutions with a potential health or safety impact, was to be approved prior to implementation.

Xerox also carefully manages suppliers that provide recycling and waste disposal services. Xerox uses a well-established audit process to ensure that these vendors' practices are safe, environmentally sound, and compliant with all regulations. Xerox requires these companies to document the final disposition of material, including electronic scrap, sent to their facilities.

As of today all of Xerox' major manufacturing sites are registered to the standard. In 1998, Xerox sales and service organizations in Switzerland and Spain joined their Danish and Dutch counterparts in achieving registration to the ISO 14001 environmental management system standard. ISO 14001 registrations are viewed as a means to meet customer requirements for corporate environmental leadership, and to achieve productivity and cost savings in daily operations while minimizing environmental impacts. Danish operations have achieved a 13% reduction in energy consumption since adopting an ISO 14001 environmental management system. Two additional

European sales and service organizations are planning ISO 14001 registration in 1999. Xerox manages environmental performance in its manufacturing operations to an internal benchmark known as Waste-Free Factory. Xerox states that their commitment to the goals of this initiative, along with global implementation of an ISO 14001-compliant environmental management system, has driven environmental performance improvements for over a decade.

[25]In Mexico, for example, an important concept in the Guadalajara pilot project on ISO 14000 for SMEs is the cooperation between large and small enterprises. On November 19, 1996, eleven large companies in Guadalajara, Mexico signed a voluntary agreement with Mexico's Ministry of Environment, Natural Resources and Fisheries, to mentor small suppliers in implementing EMSs. Each large company invited one to three of its small suppliers to participate in the Guadalajara Environmental Management Pilot (GEMP), a two-year project to learn about and implement EMSs. The large companies and the World Bank provided these small and medium enterprises (SMEs) funding for EMS training and implementation support, which a team of international and local consultants delivered. The World Bank's involvement was under its Non-Lending Services program, not only as response to the Mexican authorities' request, but also to learn, from this innovative approach, how to better promote environmental performance improvements in SMEs. Each of the 12 large companies participating in the project was assisting two SME suppliers, apart from providing financial support to the project. The project results will be used to develop a regulatory framework for the national implementation of ISO 14001.

Similarly, in Malaysia a Transnational Corporation [TNC] is providing technical assistance under a "mentor" program to make it possible for a small firm, a local supplier, to get certified.
The TNCs operate primarily on pollution sensitive industries. They possess the technological and managerial skills necessary to minimize environmental impact of these industries' activities. They help these industries in making decisions on company-wide environmental standards, the transfer of clean technology between headquarters

and affiliates, training for employees and outreach activities along the supply chain. In several cases, headquarters asked their affiliates to follow European standards and encouraged them to become ISO14001 certified.

According to the responses of managers of local firms in some third world countries, regulatory pressures varied significantly in the three countries: while regulation appeared to place the strongest pressure on investors in China, this was less the case in India and Malaysia. Half of the affiliates felt, being foreign, they were subject to stricter enforcement than comparable local companies. One explanation is host countries are adopting stricter regulations or beginning to implement their regulatory requirements with regard to TNCs and foreign direct investment (FDI).

China, for example, has stated that it cannot afford to continue with the “pollute first and control later” approach and has drawn up specific measures to control pollution at the get-go.

Market Forces acting as a driver for promoting ISO 14001 Implementation:

In the three surveyed countries, green consumerism is still very weak, particularly in the household market segment, and very few household customers are actually prepared to pay an environmental premium. Thus, the general impression is, the local market as such does not appear to be a dynamic factor in promoting and strengthening environmental management among the affiliates. This is supported by the fact that only 6 per cent of respondents cited consumer pressure as the main driving force behind environmental improvements.

With regard to global consumer preferences, previous research has shown to access the European market, where environmental consciousness is relatively strong, firms must comply with European product standards and this has prompted the introduction of better environmental practices by TNCs.

However, when the local market and export-oriented affiliates were compared, there was little evidence to indicate global market pressures to be a strong factor influencing

affiliates' environmental management practices; in fact, market-seeking affiliates reported more environmental management practices than did efficiency-seeking investors. Moreover, market-seeking investors also reported better performance than did resource- and efficiency-seeking investors.

One of the more interesting findings with regard to market orientation is the environmental performance and quality orientation being related. Among those TNCs having formalized environmental management systems in place, most had already made equivalent efforts in terms of quality management, such as BS 5550 or ISO 9000 certification.

It thus appears culture of quality to trickle down into environmental awareness. There are indications that the culture of quality was driven basically by product orientation, as this rather directly affected market performance.

Country Case Studies:

The findings in Malaysia are grouped according to the drivers of environmental management practices in the following order: environmental management practice, specifically the presence of an environmental policy; environmental standards; regulatory factors; the influence of headquarters and market and industry factors.

The survey of 59 affiliates targeted the electrical and electronics, textiles and chemical industries. Half of the companies use Malaysia as an export platform. Many were established as Greenfield investments, and most have 100 per cent foreign ownership. Interviews were carried out with employees of selected TNCs both in home and host countries.

Fifty-six per cent of the affiliates surveyed have an environmental policy. Twenty-four out of the 59 companies had their environmental policy formulated by headquarters. Despite the centralization of overall policy-making, the environmental policy is adapted to Malaysian legal requirements and to plant and site-specific needs. This variance in

the influence of headquarters on policy formulation reflects a degree of affiliate autonomy.

All companies in the survey reported, they at least met the local minimum legislative compliance requirements. Forty per cent maintained that their environmental performance was above the average local standards, and 15 per cent claimed that their performance was similar to parent-country standards. Managers in the chemical industry were significantly more inclined to report performance equal to home-country standards than were managers in other industries.

Thirty per cent of respondents cited current and future regulatory pressure was cited as the primary motivating factor behind environmental improvements. Seventy-five per cent of the Malaysian affiliates subscribe to a quality standard suggesting that the ISO 9001and ISO 9002 series have gained a great deal of popularity in Malaysia. Exporters and suppliers to TNCs consider having one or the other of these standards a necessity in order to be seen as a quality-conscious and quality-minded producer. According to figures from SIRIM (the Standard Board of Malaysia), 17,000 Malaysian companies have one of these certificates. Thirty-one per cent of the respondent companies stated that their company group followed an explicit policy of adopting the same standards regardless of location (i.e. having uniform environmental standards). Companies may adopt uniform standards that are independent of, and often go beyond, local regulatory standards because this may contribute to furthering economic and organizational efficiency for the group of companies as a whole.

Thirty-two per cent of the affiliates reported setting environmental minimum standards for their suppliers. Again, interviews suggested that these requirements are predominantly related to securing product quality rather than to processes.

However, there are exceptions. Sony Electronics, a large Japanese audio electronics manufacturer, has developed a pilot **program** for ISO 14001 certification of small and

medium-sized enterprise (SME) suppliers and subcontractors. The pilot **program** is designed to involve suppliers and subcontractors in environmental management.

Many companies point to their affiliation with a parent company or their position in a TNC as the main determinant of environmental performance. Forty-four per cent say that headquarters policies, procedures and standards are the main factor motivating them to improve their environmental performance.

Twenty-seven per cent of the affiliates stated that their headquarters set targets for environmental improvement in such areas as solid waste reduction, energy consumption, effluents and occupational safety (e.g. reduction in the occurrence of industrial accidents and lost time because of injuries and fire). Fewer than 10 per cent of the affiliates reported that consumer pressures were the primary motivating factor behind environmental improvements at the affiliate. There is little to suggest that the export-oriented TNCs have better environmental management practices than companies oriented towards the domestic market.

Thus, it appears that pressure from international consumers is not a strong factor for affiliates, although markets may of course exert a strong influence through headquarters environmental policies and programs. The only significant exception to the overall conclusion that market factors are not among the primary motivating factors behind environmental improvements is with regard to ISO 14000 certification, with a relatively large proportion of participants reporting that pressures from industrial customers had motivated certification.

The practice of environmental screening of subcontractors' and suppliers' products is more common (26 per cent) than the practice of screening their processes (19 per cent). From interviews, it appears that screening is undertaken mainly to ensure the quality of suppliers' products. Fifty-one per cent of respondents reported subcontracting of waste handling. The outsourcing of waste management is to some degree a matter of letting others outside the organization handle one's environmental problems. The

interviews gave the impression that the TNCs did not always know how their waste was handled.
The foreign subsidiaries were typically content with knowing that the waste management companies were certified to handle industrial waste. There are, however, companies where waste management is considered critical to the public image. A large electronics manufacturer reported that it had reserved a special place within the plant for initial recycling of waste. Companies are subcontracted to work on the premises. Other driving forces behind the program are the cost-effectiveness of improved waste management, materials handling, reduced energy use and better transport management. The program suggests that the potential role of big foreign TNCs as environmental mentors is far from exhausted in Malaysia.

Interviews with central environment agencies, organizations and resource persons in Malaysia suggest that TNCs are not the major cause of environmental problems in Malaysia. According to CETEC (an important environmental NGO), “TNCs generally enjoy a good reputation.” Rather, it is the large number of domestic SMEs that are the prime concern, many of them backyard industries that operate in the so-called informal sector and try to avoid government regulation. [26]

The findings in India were grouped in the following order of topics: the presence of an environmental policy; environmental standards; regulatory factors; headquarters influence and market and industry factors; the supply chain; outreach activities and ownership. The survey focused on foreign direct investments in New Delhi, Maharashtra, Karnataka (computer firms like IBM), Tamil Nadu (automobile manufacturers like Ford - In the automotive industry, the pressure on vendors to demonstrate their commitment to environmental improvement has been obvious for some time. Ford and General Motors, for example, which have implemented the international voluntary environmental management systems standard ISO 14001 in their own assembly parts, have told their 10,000 manufacturing suppliers to instigate environmental management systems by the end of 2002 if they want to continue as suppliers.) and Gujarat (chemicals firms).

It was found that most (83 per cent) of these firms had established environmental policies. Thirty three percent among these firms claimed that headquarters formulated their environmental policy. However, these firms feel that more work has to be done before they start publicizing such statements as the practice has been done in an informal manner. Regarding the extent the EMS being verified by a certification agency, of 53 per cent firms surveyed, 19 per cent had their EMS certified in accordance with ISO 14000 series. Thirty six percent of the firms were considering applying for certification. Thirty eight per cent of respondents cited lack of enforcement of environmental rules, weak or non-existent regulation or absent infrastructures as the primary barrier to improved environmental performance, which means local environmental administration affects performance. However, the main driving force for these firms has been their headquarters (large organizations). Seventy four per cent of these firms in India have systems where corporate headquarters perform environmental auditing on a regular basis. A similar number have formalized environmental reporting systems.

The survey also found that a designated environmental, safety and health officer was appointed in 74 per cent of the firms.

Regarding outreach activities, only 17 per cent of the participating firms stated that they cooperate actively with local environmental Non Governmental Organizations (NGO's). Even among these the collaboration was often limited to areas such as financial support of local welfare projects, help with safety measures, technical help to a local fire brigade and provision of general information on environmental issues to adjacent communities.[27]

Similar findings were found in the survey conducted in China. In China, although headquarters pressure followed by regulatory requirements were the most significant drivers of environmental improvements, similar to Malaysia and India. China's current and anticipated government regulations were more frequently cited.[28]

Evaluation of Study Reports on the Barriers, Opportunities and Drivers for SMEs in the Adoption of Environmental Management Systems:

[29]This study analyzed 33 separate studies published between 1994 and 1999. The selected reports investigated the adoption of formal environmental management systems (EMSs) in small and medium-sized enterprises (SMEs) and SMEs' attitudes towards environmental performance. Twenty-two of the studies provided practical experience of SMEs' adoption of formal EMSs (BS 7750, ISO 14001 and EMAS). The majority (30 per cent) of the studies was academic or research projects.

The major findings of the analysis are as follows: It is to be noted that in this study internal barriers to EMS adoption were considered to be more important than external ones.

a) **Internal Barriers to SMEs Considering Environmental Issues:**
   i) Positive personal attitudes towards the environment are not translated into actions in SMEs.

   ii) The view held by many in SMEs is that their firms have low environmental impact or face no environmental issues.

   iii) SMEs are skeptical about the benefits, cost savings and customer rewards associated with positive environmental action, and there is a belief that benefits accrue slowly but costs quickly in EMS implementation.

   iv) The environment is not a core business issue in the majority of SMEs and intransigent company culture and the lack of allocation of resources conspire to keep the status of environmental issues low on the business agenda.

b) External Barriers to SMEs Considering Environmental Issues:

Customer indifference to SMEs environmental performance, in particular the performance of micro firms, is a key reason why these enterprises consider environmental issues unimportant to business.

c) Benefits from Adopting an EMS

i) Numerous organizational improvements and efficiencies could be achieved in SMEs adopting EMSs even though these were not solely related to the EMSs, i.e., spin-off management benefits arise.

ii) The range of financial savings and payback periods for investments generated in SMEs adopting EMSs could be as diverse as the sector itself.

iii) Communication channels, skills, knowledge and attitude could improve in SMEs adopting EMSs.

iv) Key benefits are the attraction of new business and customers and the satisfaction of customer requirements.

v) SMEs found positive outcomes in terms of improved environmental performance, assured legal compliance and energy and material efficiencies.

vi) SMEs found image was enhanced and dialogue and relationships with stakeholders improved.

The pulp and paper industry is one of the oldest in India. Today there are about 350 paper mills in India, using a variety of raw materials ranging from forest-based wood to agricultural residues such as wheat straw, rice straw and bagasse. The study dealt with the cleaner production program initiated in an agricultural residue-based pulp and paper mill, Raval Paper Mills. The company was one of the demonstration units which participated in the United Nations Industrial Development Organization (UNIDO) - sponsored project DESIRE (DEmonstration in Small Industries for REducing wastes).

Implementing cleaner production techniques has created multiple benefits for Raval Paper Mills. Firstly, the economic benefits: the investment of US$ 80,000 made in implementing the first 30 measures generated savings of US$ 88,000 per year. Water consumption decreased by 28 per cent, thus enabling the unit to operate at full capacity even during the water-scarce summer period. On the environmental front, the cleaner production measures reduced solid waste generation by 18 per cent, water pollution load by 46 per cent and air pollution load by 8.5 per cent. Effluent treatment costs have been reduced by approximately US$ 55,000 per year. Other benefits are improved paper quality and a better work environment.

The main reasons for the company to adopt cleaner production techniques and technologies were:

- shortage of water especially in the summer, leading to poor capacity utilization. During this period the company normally produced 15 tons per day, 65 per cent of operational capacity;
- pressure from State Pollution Control Board (Regulatory Authority);
- pressure from local bodies and environmental NGOs, and;
- the opportunity of participating in a demonstration project on waste minimization (project DESIRE, DEmonstration in Small Industries for REducing wastes).

Raval's main aims in implementing cleaner production were to:

- reduce water consumption to enable operation at full capacity even during the summer;
- reduce waste water treatment costs;
- reduce raw material costs and thus be more competitive in the market, and;
- meet effluent discharge standards.

Under the project DESIRE, a Cleaner Production Demonstration Project was launched in the company. The waste minimization assessment methodology developed by the

National Productivity Council (NPC) was used. A waste minimization team comprising mill employees and NPC consultants was formed. This team was assisted by an expert from the United Nations Industrial Development Organization (UNIDO). The process steps were identified, a material and energy balance was prepared, and the causes of waste generation were determined to enable the team to develop waste minimization solutions. Towards the end of the project period, 64 waste minimization measures were identified. Of these, 29 measures which were directly implemented able were taken up straightaway.

Another 22 measures required further technical feasibility and economic viability analyses. Their environmental aspects also were analyzed. The measures were then prioritized and an implementation plan was drawn up. Towards the end of the project, the company had already implemented 31 measures, and another 20 were being implemented or planned for implementation in the future. 13 measures were rejected because of low expected economic gains and/or poor technical viability.

External support was provided to the company in the form of:

- measurement and monitoring facilities for preparing the material and energy balance, waste stream characterization, quantification and assessment of pollution load, the required facilities and expertise were provided by NPC, and;

- expert advisory assistance for identifying cleaner production measures and training of company staff provided by UNIDO and NPC.

d) Disadvantages from Adopting an EMS

i) SMEs found that more resources than expected, in terms of costs, time and/or skills were required for EMS implementation.

ii) SMEs are aggrieved by the cost and quality of consultants advising them. Some firms have been not advised properly and hence developed bureaucratic and ineffective systems.

iii) Identification of non-compliance was viewed as a double-edged sword, being a benefit if the company could readily rectify the cause of the

non-compliance and a disadvantage if action could not be taken because of lack of resources or unwillingness to allocate them.

iv) SMEs have dissatisfaction with the fact that benefits had not materialized as expected

The main problems experienced by Raval Paper Mills, India in implementing cleaner production were:

- lack of company-level technical expertise;
- high turnover of employees which limited the ability of the enterprise to work on cleaner production measures which require greater involvement of the employees;
- limited decision-making powers of employees, which meant that the middle-managers had little say in the decision-making process and, consequently, it took longer to implement the cleaner production measures;
- inappropriate pricing of natural resources;
- continued emphasis on end-of-pipe pollution control on the regulatory and policy level, and;
- during the project period, the plant was undergoing a financial crisis, and had serious constraints on financing.

Guidelines to build an EMS:

a) EPA Initiatives

The U.S. Environmental Protection Agency (EPA) is working with the Global Environment & Technology Foundation to implement an Environmental Management System (EMS) initiative. The EMS initiative allows EPA and the Global Environment & Technology Foundation to assist small and medium-sized government

organizations to implement an environmental management system at a local facility or organization.

Direct assistance includes one-on-one discussions about design, operation and maintenance of systems, and the identification and solution of problems. Indirect assistance includes support for the development of regulations; technical information; guidance, assessments, evaluation, and cost estimates for the design, construction, and operation and maintenance of municipal wastewater treatment facilities.

b) **BS EN ISO 14004 provides, General Guidelines on Principles, Systems and Supporting Techniques:**

ISO 14004 provides guidance on the development and implementation of environmental management systems and principles… and their co-ordination with other management systems. The guidelines in this document are intended applicable to any organization that is interested in developing, implementing and/or improving an environmental management system, regardless of size. They are intended for use as a voluntary, internal management tool and not certification or registration.
In particular, the guidance:

- establishes key principles for managers to use in implementing an EMS; sets forth the benefits of an EMS;
- provides detail on all the steps needed to begin implementation, including gaining top management commitment and leadership, conducting an initial environmental review, and establishing an environmental policy;
- helps with the planning process by offering guidance on identifying environmental aspects and evaluating impacts, establishing procedures for identifying legal and regulatory requirements, setting internal performance priorities, setting objectives and targets, and establishing an environmental management program to address schedules, resources, and responsibilities for achieving objectives and targets;
- suggests an implementation plan, with help on ensuring resources are available and adequate, aligning the EMS with current systems, assigning accountability

and responsibility, ensuring personnel have the proper skills and training and are environmentally aware and motivated to maintain the system, communicating and reporting information through the appropriate media and to the appropriate parties, and ensuring procedures for emergency response;

- suggests a way a company may establish a system for measuring, monitoring, and evaluating the performance of the management system against its objectives and targets, including identifying and implementing corrective and preventive action, the content of EMS records and means of managing EMS information, and the elements of an EMS audit;
- makes suggestions on how a company should manage its continual improvement process as applied to the EMS to achieve overall improvement in environmental performance; and
- offers examples of international environmental guiding principles, such as the Rio Declaration on Environment and Development and the ICC Charter for Sustainable Development.

9.1 Global Environmental Management Initiative [GEMI] : provides an "Environmental Management System Self-Assessment Checklist" that contains a total of 31 questions in five different sections, corresponding to the five guiding principles listed in the ISO 14004 Standard; namely..

a) Commitment and Policy

b) Planning

c) Implementation and Operation

d) Measurement and Evaluation

e) Review and Improvement

This checklist and primer has been developed to improve facility managers' understanding of the requirements and elements of the EMS outlined in the ISO 14001 standard. It is designed to allow for a rapid self –assessment of an organization or facility to determine how closely existing management practices and procedures correspond to the elements of the standard. The criterion of the

standard has been rephrased in the format of a simple questionnaire, with a three-part scoring system. In addition to a brief guide to self-scoring, a fuller description of what is required by the standard's criteria is included in the appendix. This format is to provide help even with limited background knowledge of the ISO 14001 standard, a facility or other business manager can quickly review existing operations to determine how they measure up to the standard. This is in turn serves the purpose of being the starting point of a "gap analysis" to identify management tools or system elements that might usefully be implemented in the organization to help improve overall environmental performance.

9.2 Not enough of Guidance:

Considering that ISO 14001 is a standard — not a regulation — and is therefore voluntary, one should appreciate why it is that the drafters of the ISO 14001 standard have taken a management system approach. However, there are two main problems with the form that this management system approach has taken in ISO 14001:

- The ISO 14001 standard lacks guidance, and
- Ignores a host of existing international environmental agreements.

This study is interested in the first problem with the ISO 14001 standard is that it does not offer enough guidance. By helping an organization to more effectively achieve the environmental requirements which it already faces, ISO 14001 is a useful complement to existing regulatory frameworks. However, a voluntary international EMS standard could promote more than just compliance with exiting laws and regulations. Environmental laws, regulations and guidelines address a core set of possible environmental impacts, but certainly not all those that can be reasonably addressed. Although it is clearly unrealistic to expect an organization to address all of its environmental impacts, an EMS should help an organization to identify and manage more of its environmental impacts than it is already

required to do. To help in this way, and to give direction to an organization's "continual improvement", ISO 14001 could provide additional guidance.

As mentioned, the ISO 14001 standard requires an organization to identify and address its significant environmental impacts. In keeping with the flexibility of the standard, other than those impacts already addressed by laws, regulations, or other policies to which the organization subscribes, *ISO 14001 leaves it up to the organization itself to determine which impacts are "significant enough" to be considered*. In practice, the definition of "significant" is up to the organization's environmental managers, who choose which impacts to consider, in which order they are to be addressed, and which can be safely ignored.

At present, the ISO 14001 EMS standard does not assist an organization to identify its environmental impacts nor does it help guide the organization's assessment of "significant". It could do this by: requiring an initial environmental review (as is required by EMAS),providing guidance on the environmental impacts that may exist, under what conditions they may be more or less significant, and indicating which criteria and indicators may be appropriate for the monitoring and evaluation of the goals that have been set.

In many cases, *guidance is available that can be interpreted generally* and can be included in an international standard. As an example, significant work has been done on indicators of environmental health. This research and its conclusions could help environmental managers consider their organization's impacts and progress towards its goals. Once again, this does not mean that the standard should be amended to include performance requirements. Appropriate performance levels can rarely be set beyond a national level, and are often hard to develop even there. The ISO 14001 standard will never dictate specific international performance requirements. It can, *however, provide specific guidelines on what impacts are likely to exist, which should be considered, and in which priority*. Although it may be unrealistic to expect it to voluntarily reduce all

environmental impacts, an organization should be expected to use all available information and to take all reasonable steps. Even a low baseline of guidance in this respect is better than none at all.

9.3 Other concerns:

The main concern of many environmentalists is that the ISO 14001 standard does not do enough to promote **responsible** environmental management. The existing framework stops at the facilitation of **effective** environmental management.

The principle of ISO 14001 is simple. It is an environmental management system standard which defines certain requirements as stated above that the particular environmental management system of a company should meet. These are all ***procedural requirements as opposed to substantial commitments*** setting specified levels of environmental performance. Of course, it is expected that meeting the procedural requirements will ultimately bring about environmental improvements. Once a company meets these requirements, it can apply to external bodies (different for EMAS and ISO 14001) for certification (ISO 14001) respectively registration (EMAS). Certification and registration basically means being officially recognized as fulfilling the standard requirements. Once certified or registered, the company can exploit this recognition for external or internal communication purposes.

A key feature of both systems is that they are ***voluntary, i.e. individual companies are totally free to participate or not.*** This creates a new challenge for the regulator in comparison with conventional policy approaches for encouraging industrial participation, since a voluntary program can only benefit the environment if at least a number of companies participate.

Sector specific standard: ***ISO 14001 is a generic EMS standard,*** designed to apply to every type and size of organization. Some industry sectors, however,

feel that the generic approach may not reflect their particular situation and needs. There has been some pressure for the development of sector-specific standards. Previously, similar pressure led to the establishment of ISO TC/210 for quality management in medical devices, as well as the development (outside ISO) of the QS 9000 quality standard by a group of large automobile producers. If this is the case, it would benefit SME's to some extent.

Cost Factor: As mentioned above in the problems SME's face there are two elements which are important in determining the costs of participation in the ISO 14000 certification standard:

a) The incremental costs in meeting the requirements of an EMS like ISO 14001 (e.g. setting up and maintaining an EMS, hiring consultants, meeting company-determined performance goals); and
b) Costs of certification and registration to ISO 14001.

These costs vary considerably from case to case, depending on the initial conditions within an organization, as well as conditions external to the organization, such as the availability of infrastructure.

A UNDP study shows that the prospective costs of compliance with ISO 14001 standards may be high for SME's, particularly if they have not got a formal management system in place, if they are not in compliance with the existing environmental regulations, and if they have to rely on the services of expensive consultant firms.

For an organization with an EMS in place, fulfilling the requirements to participate in ISO 14001 may be relatively easy. For others however, implementing and maintaining an EMS involves a complex and time-consuming documentation process. Latter is the case with most SME's. In addition, companies participating in ISO 14001 may be expected to go beyond the levels of environmental

stringency established by law by committing themselves to continual improvement of their EMS which ultimately adds to the cost of implementation.

Economic concern: A recent study 19 lists the following potential "internal benefits" of an EMS being reduced environmental incidents and liability, increased efficiency, improved environmental performance, and improved corporate culture. But, ***uncertainty exists about the significance of improvements in economic performance*** following the implementation of EMS. This underlines the importance of an objective assessment of financial benefits.

CHAPTER 6

I] METHODOLOGY[30]

There are a small but growing number of individuals in small organizations that are engaged significantly in designing, developing, and implementing a strategic environmental, health, and safety management system. Consequently, surveys or superficial sampling efforts are unlikely to produce a significant body of data. Additionally, surveys do not easily capture an understanding of individual and organizational motivations, reactions and dynamics, elements that are fundamental to thorough analysis and successful prediction. Clearly, qualitative research methodologies are more suited to this investigation. Among them, the in-depth, semi-structured interview appears likely to produce the best results as this method allows the interviewer to explore areas in which the interviewee has a greater depth of knowledge and avoid wasting time on areas in which he or she does not. This will be especially useful in seeking to verify, validate or solicit comments on data obtained from other sources or in order to test hypotheses developed in this research.

1.1 Limitations of this Methodology

- The “facts” represent only part of the picture. Since so much of this development is new, soft, and sensitive to feedback, the extent to which the decision-maker “believes” that what he or she is doing is the right thing to do at this time will influence its chance of success.
- Second, since the perceptions of each individual are shaped by a different set of factors, interviews will provide an opportunity for the interviewer not only to identify these influences but possibly to make some assessment regarding their relative strengths.

1.2 Sampling Strategy

An effective sampling strategy in this situation began with identifying and accessing key individuals and in every interview, ended with reconnaissance questions (e.g., Is there

anyone else that you think I should talk to about this? Would you introduce me to this person?). This sampling strategy is known as snowball sampling and its strengths lie in its effectiveness at identifying individuals and organizations central to the research and in identifying social networks associated with the topic being investigated.[31] In this way, the sample interviewee list would grow (snowball) over time toward more and better information sources. When additional significant resources no longer are being identified, this may provided a useful indication that field research needs are satisfied.

The organizations investigated include small and medium business (SME) already ISO 14001 certified and large organizations involved in assisting SME's develop an EMS. Individuals interviewed within these organizations included corporate-level officers, managers, environmental directors, and other participants in the design, development, and implementation of EMS. Some relevant individuals involved in ISO leadership were also to be interviewed but due to a time constraint and the positions they held in the organizations it was not possible to do so.

Based on the sampling strategy explained above the following seven SME's were identified as the sample: -

1. AMERICAN REFUEL - division of Duke Power we firmly believe in our responsibility as a corporate citizen. We work hard to balance community, environment and business needs -- to deliver effective energy solutions.
2. CPS -
3. JAMESTOWN ELECTROPLATING - an environmentally conscious company, whose compliance exceeds all environmental regulations. With an outstanding commitment to environmental protection, the organization utilizes the latest technology in waste management. All metals are reclaimed and total destruction of all waste materials is completed at environmentally certified facilities.
4. DRESSER RAND - Dresser-Rand Company is wholly owned by **Ingersoll-Rand** of Woodcliff Lake, New Jersey. Being the world's leading energy conversion company means more than delivering efficient compressors, turbines and other equipment on

time and on budget. The organization focuses on the desired end result instead of on the standard way of doing business, hence is able to provide the most efficient, cost-effective answer for each energy conversion requirement. The organization believes that proper execution of a good design is vital, so the company has invested both human and financial resources at an unprecedented level to upgrade all their facilities. As a result, being ISO-certified, state-of-the-art facilities the organization claims to be among the worlds most advanced for turbo compressor design, production, and testing.

5. ANOPLATE - Anoplate operates from a 104,000 square foot facility, single location in Central New York State.

6. Anoplate offers metal finishing services including plating of copper, nickel, chromium, zinc, cadmium and tin, various types of anodizing of light metals, conversion coatings such as passivate and phosphating, dry film lubrication, small lot painting, and vacuum impregnation. Anoplate has implemented an ISO 14001Environmental Management System (EMS) to formalize our environmental programs into a single integrated system. The Company's Environmental Policy, is the cornerstone of the EMS, establishing the guiding principles for all Company activities. From the Policy flows a set of objectives, targets, programs and projects and metrics to demonstrate the continuous improvement of the Company's environmental performance. ZOTOS – is a professional beauty industry leader that manufactures and markets a full range of hair-care, texture service and hair color options for today’s salon professionals. In 1996, Zotos acquired the professional salon services from Helen Curtis Inc. which included the establishment of ISO 14001.

7. MAGENTIC TECHNOLOGIES - as a "contract manufacturer" has established itself as a premier manufacturer of precision assemblies for the reprographics and automotive industries with specialization in magnetic brush technology. ISO 14001 certification was achieved in 1999.

1.3 Protocol and Logistics

The SME's as in the study subjects were approached in the following manner. The approach consists of pre-interview, the interview and post interview activities. These were the steps observed

Background research was conducted for each company to get familiarized with the organization and to identify the appropriate Interviewee(s) within the organization;

- Each EE was called to briefly explain the ER's status as an MS candidate in RIT's Environmental, Health, and Safety Management program, and the purpose of the study;
- The ER's interest in interviewing the EE and the interview process were explained to the EE;
- The ER sent an introductory letter to the EE with an attached resume;
- The introductory letter was followed-up with a second call to establish the time and date of the interview.
- The ER traveled to the location of the EE's whenever possible.
- The ER offered to provide the EE with a summary of the findings of this work.
- A letter of thanks was sent to the EE.

1.4 Human Subject Protection

The ER shall:

- Provided the EE in advance of the interview, with a written statement introducing the rationale for the research project, and describing the semi-structured interview procedure to be used by the ER;
- In advance of the interview, each EE was provided with background information on the ER;
- Before beginning the interview, the ER requested permission to record the interview on audio tape for sole purpose of enhancing the ER's note-taking ability;

- The ER explained that the EE may request that any part of the EE's response be kept confidential or off the record;
- The ER explained that the EE may turn off the tape recorder at any time during the interview, or not use it at all;
- The ER showed the EE how to shut off the tape recorder and place the recorder within the EE's reach;
- The audio tapes were kept secure and inaccessible to others outside of this study;
- The ER erased the audiotapes after the transcribing and analyzing their contents.

1.5 Coding & Analysis

Coding is central to developing analysis.[32] It is a process of identifying data elements in terms of where and why they relate to the topic under investigation. It provided a means of tagging data elements so that they can be pulled back together to provide a theoretical building block, to substantiate a theory, to refute one, etc. There are two basic steps in coding:

1. Tagging the data element with one or more appropriate codes; and
2. Placing the coded data element into a corresponding file where other like-coded elements exist.[33]

Each of these steps involved analytical elements. Determining an appropriate code for a data element required understanding of what the datum is and what it represents. Filing it required a determination of fit and resulted in fine-tuning of the category description or, if warranted, in the creation of a new category. Codes categorized responses to interview questions and texts extracted from archival sources were developed during analysis. To begin, interview data was segregated by question, and arranged and coded across the range of responses in each area.

The Constant Comparative Method (CCM) of data analysis was conducted concurrently with coding efforts. Following the process developed by Glaser and Strauss,[34] data categories were developed and defined as discussed above. As category definitions are fine-tuned and strengthened, relationships among them were discerned and used as building blocks for theory. When additional data elements had little to add, major themes were documented. CCM was used to organize text and to develop an initial hypothesis, which then was developed further and strengthened using the more rigorous Negative Case Analysis methodology (NCA). CCM/NCA analysis was supplemented and supported by triangulation using multiple-use interview and multiple-source data texts. Member checks were performed for verification of specific explanations or clarification of interpretations. Additional discussion on analytical methods was included in the sections on Reliability and Validity below.

Coding to ensure good housekeeping of data coincided with the activities described under Reliability below.

1.6 Reliability

The reliability of a research effort is a measure of the consistency of the results when a research instrument is used repeatedly in the same way to evaluate the same event. Inconsistencies in the application of research methodologies pose the greatest threat to reliability in qualitative research.[35] In Interpreting Qualitative Data, David Silverman addresses reliability in qualitative research observations, texts, interviews and transcripts.[36] With respect to observational studies, he recommends, among other things, that notes be systematized to avoid inconsistencies and that expanded notes be made as soon as possible after each field session. This avoids or minimizes errors that could arise from later misinterpretation of notes, particularly when trying to make distinctions among verbatim quotes, paraphrases and contextual interpretations. Concerning the analysis of existing texts (i.e., prepared bodies of data), he alerts the reader that a lack of ‘inter-rater’ consistency among analysts of the texts will lead to inconsistencies and consequently produce unreliable results. He identifies interview

reliability as a central issue in qualitative research and highlights the importance of consistent interview schedules (i.e., sets of interview questions, prompts, etc.) and consistent understanding of the questions by the interviewees. To achieve interview reliability, he again recommends 'inter-rater' reliability checks as well as interview schedule testing, interviewer training, and maximum use of fixed-choice answers. Finally, Silverman identifies transcripts of audio recordings of interview sessions as satisfactory for ensuring transcript reliability and documenting data collection procedures. Each of these recommendations are presented and discussed below with respect to their application to this research.

a) Systematize note-taking conventions. In order to eliminate or minimize contextual misinterpretations, an attempt was made for all interviews conducted for this research to be audio taped. Correspondingly, field notes was taken to identify body language and gestures that may impart additional meaning or understanding to the text or to highlight topics that need to be revisited either during the interview or in connection with other sources that corroborate or challenge the text. Simple abbreviations were used, when needed to describe gestures or facial expressions associated with specific topics that appear to convey. Verbatim transcripts of audiotapes were prepared using systematic conventions to delineate contextual variations.

   a) Expand notes as soon as possible. The field notes were reread as soon as possible after each interview and elaborated upon areas needing additional detail. Strategies that worked well or that did not work were identified. The audiotapes were transcribed and transcriptions were annotated with field notes, comments and references to other text that corresponded, within 48 hours or less if possible. If transcription was not possible within one week of the interview, the tapes were replayed and additional notes taken elaborating on any areas that seemed confusing with time.

   b) Perform 'Inter-rater' reliability checks. The single most significant factor in minimizing inconsistencies in the application of research methodologies in

this work was the involvement of one individual. This helped in eliminating the interpretative filters of multiple interviewers, transcribers and analysts, which would amplify and enhance each of the strategies described above.

There was an attempt to use maximum number of fixed-choice answers. A consistent interview guide was developed and implemented. The interview guide originally developed during the proposal was considerably changed after the pilot interview was conducted.

1. To the extent possible without significantly impeding the natural flow of information the prescribed interview schedule was followed. However, while a standardized open-ended interview format including previously prepared questions proved a better option for interviewees with limited available time,[37] as was likely to be the case in much of this work, it was of consideration how each individual interpreted the questions being asked. Understanding of a question varied from one person to the next depending upon how a person "sees" the world and perceives the motives behind asking the question. This created a potential dilemma in a consistent understanding of the question, and in the interpretative differences among the interview subjects.

2. In preparing for each interview, the implications of the interviewee's position (e.g., director of corporate environmental affairs, commissioner of environmental protection, developer of ISO14000 standards, etc.) were assessed and any available writings by that person relating to the research topic were taken into consideration. This step was considered important in preparing for each interview, but the emphasis remained on providing the interviewees with a consistent understanding of the questions. In cases where such consistency was inappropriate (e.g., because it would force the interviewee to respond in a manner inconsistent with his or her own vision or understanding), or impossible (e.g., because the interviewee will not respond to the question as asked), there was an attempt to determine the basis for the aversion.

3. Establishing rapport, imparting a sense of trustworthiness, and creating a context for expressing feelings, opinions and communicating knowledge and opinions early on in the interview was helpful in engaging the interviewee.[38] Each interview was initiated with a casual, candid and value-neutral description of the purpose for and nature of the research, and with a fairly general, non-controversial first question prefaced by a narrative description in a relevant and historical event and establishing a context for the response.

When additional areas of inquiry or area-specific issues were uncovered, it was added to the interview schedule for subsequent interviews, these additions was, to the extent possible and reasonable, positioned in the question sequence so as to minimize the disruption of the information flow in the original set of questions and probes.

Document data collection procedures. Taken together, the research guide, audiotapes and field notes adequately document data collection procedures.

1.7 Validity

The validity of a research effort is a measure of the extent to which the findings and conclusions of the work accurately explain the activity under investigation. Also, it asks whether the right thing is being measured. Validity of qualitative research data can be established, however, by carefully and incisively identifying and evaluating competing interpretations of the data. Lindlof provides four proven methodologies involving this strategy: Triangulation, Negative Case Analysis, Member Checks and quitting the Field. [39] Each is presented below and discussed with respect to their application to this research.

1.8 Triangulation

This method compares multiple sources of information about an object of inquiry. Data may be derived from multiple use of a single method (e.g., in-depth interviews), single

(or multiple) use of multiple methods (e.g., interviews and examination of archival texts), or by the use of multiple investigators. Triangulation provides both a credible means of verifying data and of developing concepts. The use of multiple methods is the most common approach to triangulating research text. In the most common approach (i.e., multiple methods) explanations derived from one method, from among those employed, then are enriched or qualified by text generated using complementary methods. Although multiple-investigator methodology introduces additional variables to the study, it can be used to take advantage of the strengths and to compensate for the weaknesses of individual analysts.

Silverman argues that attempts to develop and validate explanations by aggregating data taken in different contexts ignore both the 'skillful character of social interaction" (i.e., does not recognize the fact that different methodologies can elicit different responses to what essentially may be the same question), and the differences in boundaries imposed by each methodology.[40] He suggests that this concern can be addressed by triangulating methods and data only to the extent that they focus on the understanding of why an event is occurring rather than how.

Multiple-use of in-depth interview methodology and use of multiple-methods (i.e., in-depth interviewing and examination of archival text) are applied in this investigation as the principal strategy for validating this work. Alternating between these methodologies provided the research with opportunities to identify essential information sources, refine investigative strategies and verify data. Analysis of areas of convergence was directed towards understanding why, rather than how events are occurring.

1.9 Negative Case Analysis (or Analytic Induction)

Negative case analysis is an iterative process in which a hypothesis is formulated, then tested by applying it to a case or to data generated during the research, modified as necessary to accommodate the data, tested against new data, modified again, tested again, an so on until a universal relationship is developed. Silverman suggests that in qualitative research, analytic induction replace the quantitative function of statistical

testing; since hypothesis development continues until all the data fit, random error variance is eliminated and statistical analysis becomes unnecessary.[41]

Both Lindlof and Silverman identify Glaser and Strauss' Constant Comparative Method (CCM) as appropriate for developing the initial hypothesis for use in Negative Case Analysis (NCA). Glaser and Strauss differentiate between the two methods by making the distinction that CCM is used to develop, but not prove, a plausible hypothesis about a general problems, and NCA is concerned with developing and proving a universally applicable theory about a specific behavior.[42]

In this research, the development of the hypothesis was based on the CCM and the concept of NCA was used for further refinement and verification. The questions in the interview guide themselves have been subjected to an evolutionary process of development resulting in significant adjustments to the concepts researched themselves.

Application of the constant comparative method has provided an evaluative framework for focusing on the substance, or aspect, of the topic. At each stages of this evolution, data coding categories were created in which elements of each observation were placed (the first step in CCM), revealing areas of depth and potential significance and beginning to provide the dimensions and theoretical properties of these areas. This sometimes resulted in a shift away from the original area of inquiry and toward new areas identified through this process. This research revealed that the main obstacle SME's faced in getting geared towards ISO 14001 certification or development of an EMS is the time and resources involved in the whole process. Those who work with SMEs on environmental issues report the same findings
again and again. The area of documentation also posed a great deal of complexity. The research indicated that areas such as verification and management involvement in making decisions about continual development posed a big challenge as they are seen as conceptual areas. Therefore delving into this area indicated the need to understand the advantages of establishing an EMS. SMEs often have to concentrate their efforts on

matters of day-to-day survival such as paying bills, providing weekly pay packets and keeping orders coming in. Environmental management requires time to implement and money to undertake, time and money which, SMEs feel they do not have available. In short a environmental management system is seen as a luxury that SMEs cannot afford.

1.10 Member Checks

While warning that no one member of a culture is fully informed about his or her culture, Lindlof suggests that member checks can be a useful way to test or validate hypotheses, explanations or interpretations presenting them to members of the culture.

Member checks may be used in this work to test a particular interpretation or explanation or simultaneously as a prompt to determine a response to a proposed hypothesis. In this research, the EE was prompted by the ER during the interview process to get more clarification or explanation of a particular response. Well, did you or did you not use member checks?

1.11 Quitting the Field

When new data are consistent with the hypothesis or explanation, require no modification and provide no new surprises, the study has reached a point of theoretical saturation. It is time to review what has been done and end the project. In this research, the consistency of information transcribed from the interviews became evident after the information was coded for analysis. This work ended when a point of diminishing return was reached to the extent that new information duplicated which, was indicated after the information from the interviews conducted were coded. Hence there was no significant modification to the hypothesis or explanation required.

II] PROCESS FOR ANALYSIS:

The information gathered during the interview is subjected to the following five steps of analysis in this research.

Steps 1: INTERVIEW GUIDE

The interview guide consisted of 14 questions that correspond to the 14 cases. The cases are arranged according to corresponding sub- sections of the ISO14001 Environmental Management Standard under the two main Sections 4.5 and 4.6. The cases are as follows:- Where are they? I don't understand the logic here. Why not just call them questions and include a rationale for each? Using the term "cases" is confusing, because it usually implies case studies rather than areas of inquiry. You need to build in more continuity in this section. It looks like you just stuck a bunch of relevant sections in here without bothering to connect them. Integrate this better and let the reader know how to read this.

Section 4.5 Checking and Corrective Action

The intent of this section is to "Assess how well the system is doing." This is to enable an organization to:-

- evaluate environmental performance
- analyze root causes of problems
- assess compliance with legal requirements
- identify areas requiring corrective action
- improve performance and increase efficiency

4.5.1 Measurement and Evaluation

This sub-section intends to establish procedures that enable different types of monitoring and measurements that are required to ensure

a) operational controls are being implemented correctly
b) that the organization is complying with applicable legal requirements
c) that the organization is achieving the stated EHS objectives and targets
d) proper identification of equipment is used for the above three steps

e) proper calibration and maintenance of the equipment is carried out
f) periodic evaluation of compliance with legal requirement

ISO 14001 requirement:

The organization shall develop procedures to

- monitor key characteristics of operations and activities that have significant EHS impacts and/or compliance requirements
- track performance including progress in achieving objectives and targets; the procedures shall record quantifiable data, which will be used for this purpose
- calibrate and maintain monitoring equipment; and
- through internal audits periodically evaluate compliance with applicable laws and regulations
- designate a person who will establish and maintain procedures for the monitoring and measurement of key activities and processes, which have significant EHS impacts.

The rationale for the questions were based on the ISO 14001 requirement which correspond to the following cases as each question corresponds to a case–

Case 1: Have procedures been established for monitoring and measuring on a regular basis the key characteristics of the operations and activities that can have a significant environmental impact?

Case 2: Is there a designated person responsible for establishing and maintaining the procedures for the monitoring and measurement of key activities and processes with significant EHS impacts?

Case 3: Are there established documents that ensure periodic evaluation of compliance with applicable EHS legislation, regulations and permits?

4.5.2 Non-conformance and Corrective and Preventive Action

This sub-element intends to establish procedures that must be maintained for defining responsibility and authority for investigating non-conformances with the EMS and taking action to correct EHS impacts when requirements are not me proper inquiry and corrective measures are:

- Determining the cause
- Deciding if immediate action is required
- Deciding which action should be taken in order to lower the risks to acceptable levels
- Checking to see if measures are effective
- Recording shortcoming of Corrective Actions
- Recording changes in procedures required to avoid duplication

The ISO 14001 requirement:

The organization shall establish and maintain procedures

- For defining responsibility and authority for handling and investigating nonconformance;
- Taking corrective action to mitigate any impacts caused; and
- For initiating and completing corrective and preventive action.

Any corrective or preventive action taken to eliminate the causes of actual and potential nonconformance shall be appropriate to the magnitude of problems and commensurate with the environmental impact encountered.
The organization shall implement and record any changes in the documented procedures resulting from corrective and preventive action.

The rationale for the questions were based on the ISO 14001 requirement which correspond to the following cases as each question corresponds to a case–

Case 4: Have procedures been established for defining responsibility and authority for handling and investigating nonconformance with EHS legal requirements and the with the organization's environmental policy or policies, objectives and targets?

Case 5: Have procedures been established for determining the corrective and preventive action accordingly?

Case 6: Does your organization have a system to evaluate the appropriateness of corrective or preventive action, by reviewing causes, trends and patterns, and environmental impacts of nonconformance?

Case 7: Does your organization provide for prioritization of a corrective / preventive action needed to ensure the action is commensurate in lowering the risks to acceptable levels?

4.5.3 Records

This sub-section intends to establish procedures that identify -

- Which records should be maintained under this portion of the Standard? What the organization's capabilities are for maintaining these records? (Electronic media is more efficient for this purpose where possible.)
- Are there process records that might be included in this Record-keeping?
- Can any records that are centrally important be easily retrieved?
- Are the records safe?

The ISO 14001 Requirement:

The organization shall establish and maintain procedures for the identification, maintenance and disposition of environmental records. These records shall include

- Legal and other requirements listing.
- Environmental Aspects determination documentation
- Training records.

- Inspection and monitoring data.
- Calibration and maintenance records for instrumentation.
- Non-conformance and corrective actions records and reports.
- Environmental audits and management review documentation.
- Records of emergency response drills
- Contractor and Supplier notifications regarding EHS aspects.

The Environmental records shall be legible, identifiable and traceable to the activity, product or service involved. Environmental records shall be stored and maintained in such a way that they are readily retrievable and protected against damage, deterioration or loss. Their retention times shall be established and recorded. Records shall be maintained, as appropriate to the system and to the organization, to demonstrate conformance to the requirements of this International Standard.

The rationale for the questions were based on the ISO 14001 requirement which correspond to the following cases as each question corresponds to a case–

Case 8: Does your company have procedures for the identification, maintenance and disposition of environmental records been established and maintained?

Case 9: Do the EHS records include training records, results of audits / reviews, information on responsibilities?

Case 10: Are the records legible, identifiable and traceable through sampling records?

Case 11: Are the EHS records stored in such a way as to be readily retrievable and protected against damage, deterioration or loss?

4.5.4 Audits

This sub-section intends to be aware of any audit procedure that may exist in the organization. This includes the audit frequency and procedures established to follow-up on resources that may be required to take a corrective / preventive action for any non-conformances that may be a result of the audit.

Note: This sub-section was not dealt in detail in this research as it was not included in the scope of the study.

The ISO 14001 Requirement:

The organization shall establish and maintain (a) program(s) and procedures for periodic environmental management systems audits to be carried out, in order to:

a) determine whether or not the environmental management system
   i) conforms to planned arrangements for environmental management including the requirements of this International Standard; and
   ii) has been properly implemented and maintained; and
b) provide information on the results of audits to management.

The organization's audit program, including any schedule, shall be based on the environmental importance of the activity concerned and the results of previous audits. In order to be comprehensive, the audit procedures shall cover the audit scope, frequency and methodologies, as well as the responsibilities and requirements for conducting audits and reporting results.

Case 12: Does your organization have (a) program (s) and procedures for periodic environmental management system audits and follow-up system?

Section 4.6 Management Review

This sub-section intends to establish a review process that would:

- Assess whether company personnel have complied with Policy and Procedures
- Review targets, objectives, and environmental performance indicators to establish their continued suitability in light of changing environmental impact and concerns, regulatory developments, concerns among interested parties, market pressures, internal changes/organizational activity changes, and changes in the environment.
- Determine if targets and objectives are being met.
- Determine if capital resources are adequate for supporting the EMS requirements of the firm.
- Review regulatory compliance and whether EMS requirements have been achieved.
- Determine root causes of systemic non-conformances.
- Determine if the Operational Controls, Procedures, Corrective Actions, Preventative measures, and Continuous Improvement efforts have resulted in enhanced environmental performance
- Formulate corrective actions, preventative measures as a result of the review of systems nonconformance, and verify Corrective Actions are effective and appropriate.

The ISO 14001 requirement:

The organization's top management shall, at intervals that it determines, review the environmental management system, to ensure its continuing suitability, adequacy and effectiveness.

The management review process shall ensure that the necessary information is collected to allow management to carry out this evaluation. This review shall be documented.

The management review shall address the possible need for changes to policy, objectives, and other elements of the environmental management system, in the light of environmental management system audit results, changing circumstances and the commitment to continual improvement."

Case 13: Has your top management reviewed the environmental management system (EMS) and what have they considered when reviewing the performance of the EMS?

Case 14: What were the expectations from the concept of continual improvement?

Step 2: CATEGORIZATION OF DATA

For each of the above listed respondent [company's that were interviewed] the findings are extracted from the interview transcripts. The findings were coded and categorized into three areas, namely:-

- Category 1 : Verified whether one of the paragraphs in this category was applicable to the situation identified by the respondents. If that was the case then the score would be "0". If that was not the case then proceeded to the next category.
- Category 2 : Verified whether any of the statement in this category was applicable to the situation identified by the respondents. If that was the case then the score would be "1". If that was not the case then proceeded to the next category. This phase indicated identification of areas where the respondents could improve their EMS.
- Category 3 : Verified whether the respondent conforms to all the paragraphs in this category. If that was the case then the score would be "2". This indicated to the respondents that the EMS was successfully implemented as intended. If that was not the case then reverted to the previous two categories.

The comparative table is provided in the section that reports the analysis for this research (see table #) where each column represents a scenario corresponding to the three categories mentioned above. A separate row to record any observations is also provided**.**

Step 3: Scoring

The findings are compared across the columns provided in a comparative table, which illustrates a situation that could have three possible outcomes in each case. Each one of those columns corresponds to a score namely 0,1 or 2 where -

0 : Does not comply with the question stated in the case

1 : The requirement is more or less fulfilled, but there is room for improvement

2 : The requirement appears to be completely fulfilled. However, this does not necessarily mean that the requirement is essentially met, all the key criteria. It only ensures that the company is compatible with the EMS as described in the ISO 14001.

Step 4: INTERPRETATION OF RESULTS

The result is interpreted on the 3 point score criteria mentioned in step 3. As mentioned in step 1 each of the 14 questions in the interview guide corresponds to the 14 cases. Considering that each of the questions/ cases got a score of 2 (the highest score that could be assigned to each of the questions / cases) would result in a perfect score of "28". This would indicate that the particular stage of the EMS had all the requisite elements and procedures required for a draft standard which if sufficiently implemented would adhere to the ISO 14001 standard. A score of "0" would be considered seldom as the most rudimentary elements of mere legal compliance require the establishment and use of a minimum of management practices. Note: However, regardless of how well organizations implement the ISO 14001 standard's requirements is not the level of performance achieved using the standard, but the completeness and adequacy of the procedures and systems established to achieve that performance.
The observations (if any) made were also considered for interpreting the results obtained.

Step 5: ANALYSIS

A separate comment section is provided which consists of a descriptive summary of the analysis.

Step 6: SUGGESTIONS

Suggestions are made for each case based on the interpretation of results, analysis and review of literature.

CHAPTER 7

FINDINGS AND ANALYSIS

As mentioned in the methodology, the information gathered from the interviews was transcribed. The transcribed information was coded and like coded elements was grouped together. The grouped data elements were placed appropriately under the 14 cases. Concurrently with the help of the Constant Comparison Method conducted led to the development of the initial hypothesis which was further strengthened by the Negative Case Analysis methodology. Accordingly, the finding under each organization/respondent is listed under each case which corresponds to the sub-elements of sections 4.5 & 4.6 of the ISO 14001 standard. The findings are then compared across the table on a 3-point scale described in Step 3 and the results are interpreted according to Step 4 of the analysis process.

For the purpose of comparative analysis which is Step 5, each of the respondents / organizations is assigned an alphabet code which is as follows:-

A corresponds to AMERICAN REFUEL

B corresponds to CPS

C corresponds to JAMESTOWN ELECTROPLATING

D corresponds to DRESSER RAND

E corresponds to ANOPLATE

F corresponds to ZOTOS

G corresponds to MAGENTIC TECHNOLOGIES

Section 4.5 Checking and Corrective Action

4.5.1 Measurement and Evaluation:

Step 1

Case I: Have procedures been established for monitoring and measuring on a regular basis the key characteristics of the operations and activities that can have a significant environmental impact?

Step 2

Findings:

A. AMERICAN REFUEL- There is no set procedure established for monitoring and measuring on a regular basis. However monitoring and measuring of key characteristics of the operations and activities that have been identified to have a significant environmental impact is done on the need basis. The need is mostly determined by regulatory commitments such as generation of a report to the EPA. The annual EMS evaluation determines if there were potential problems the monitoring and measurement procedures overlooked. Then the organization did a short term correction. For the long-term action they put it on the target list that was considered to make future decisions.

B. CPS- Based on the controls for each significant aspect/impact identified, an appropriate monitoring/measuring procedure was documented, for e.g. the aspect identified was the filter bag for wastes which had an impact on the waste facility in terms of significant costs involved – the control measure was to establish and implement better waste handling procedures; the monitoring & measurement CPS waste tracking report, recording of waste disposal invoices.

C. JAMESTOWN ELECTROPLATING – There are procedures established for monitoring and measuring. The measures were specified for each significant aspect

and the frequency of monitoring was dependent on the impact. Environmental impacts of the identified aspects were prioritized depending on the extent the impact was regulated. For e.g. the wastewater treatment facility i.e. as the operations that was identified as a significant aspect to have an impact required a daily inspection versus non hazardous waste data was compiled only annually.

D. DRESSER RAND - There are procedures established for monitoring and measuring. The consideration for the significance of an impact and the frequency of monitoring and measuring the controls or identified operations was based on regulatory consequences of a particular impact.

E. ANOPLATE -The organization described that monitoring and measuring of an operation was more random in nature based on the requirements of the law. This process helped them be in compliance but the organization did feel a set procedure would help in organizing their resources better. The monitoring and measuring information of the operations that were identified to have significant environmental impact was fitted into the process flow chart slots required by ISO 9000. This was then incorporated into the ISO 14001.

F. ZOTOS- There was procedures defined for monitoring and measuring on a regular basis. Each significant impact was identified for the key operations identified and each of the significant impact was assigned an appropriate checkpoint.

G. MAGENTIC TECHNOLOGIES - There were procedures where, each objective and target was analyzed for the best measurement that would enable the job to reach the performance criteria and accordingly monitored and measured to track progress.

TABLE 1 Categorization of findings:
Case 1: Identification of operations and activities that can have a significant environmental impact

Respondent	Category 1	Category 2	Category 3
	There were no procedures to monitor the key characteristics of the operations and activities that can have a significant environmental impact	▪ Procedures have been established for monitoring on a regular basis some of the key characteristics of the operations and activities that can have a significant environmental impact. ▪ Procedures for either of the above have not been documented. ▪ There is no system in place to periodically review these procedures. ▪ The results of such monitoring are not documented or recorded.	▪ Procedures have been established for monitoring on a regular basis the key characteristics of the operations and activities that can have a significant environmental impact. ▪ Procedures require the recording of information to track performance, relevant operational controls and conformance with the organization's objectives and targets. ▪ These procedures have been documented and reviewed regularly. ▪ Monitoring equipment has been calibrated and is maintained. The records of this process are retained according to the organization's

			procedures.
American Refuel		1	
CPS			2
Jamestown Electroplating		1	
Dresser Rand		1	
Endplate		1	
Zoos			2
Magnetic Technologies		1	
Self Observation: *The general practice is to identify significant aspects and assign appropriate monitoring/measuring procedures based on the regulatory consequence it poses. This could be true of SME's as due to lack of resources (time /cost/expertise) most SME's first focus on remaining in compliance. In large companies, the specialized departments for each function take care of such processes in a more detailed manner.*			

Step 3: Scoring

Assigned Code	Respondent / Organization	Category 1	Category 2	Category 3	**Score for case 1**
A	American Refuel		1		**1**
B	CPS			2	**2**
C	Jamestown Electroplating		1		**1**
D	Dresser Rand		1		**1**
E	Endplate		1		**1**
F	Zoos			2	**2**
G	Magnetic Technologies		1		**1**

Step 4: Interpretation of Results

The respondents / organizations A,C,D,E & G have a few procedures that are developed or implemented for the purpose of monitoring and measuring the key characteristics (to the extent identified) for operations that have a significant environmental impact. However, they do not adequately identify the non-conformances and as a result, corrective or preventive measures cannot be effectively taken.

The respondents / organizations B & F have adequate procedures that are described in the ISO 14001 standard developed or implemented effectively. This regularly monitors and measures the applicable key characteristics of the operations, and might have some key elements to deal with non-conformity. However, much improvement is still warranted to conform to the standard.

Step 5: Analysis

The organizations mostly adapted the following procedure to monitor and measure the key characteristics of operations and activities that can have a significant environmental impact.

1) All the respondents identified key activities as it posed a **significant impact** on the environment.
2) Prioritized the impacts based on its regulatory consequences primarily. As the nature of operation at the organization had so many environmental impacts, addressing the issue according to the legal liability it posed was of prime concern to the business itself.
3) Accordingly in order of priority, resources such as expertise, equipment and time for monitoring and measuring was allotted. For e.g. wastewater treatment plants required daily inspection mentions respondent [C] because of the quantity and variation of the parameters of the wastewater generated itself.

However, there has also been a respondent [E] where there was no set procedure for monitoring and measurement. It was considered a subset of the “PDCA” cycle i.e. the

“check” step of the cycle. The procedure was not conducted on a fixed schedule. It was rather carried out as often or infrequently as the regulatory reporting required it. For e.g. if a particular parameter of the waste stream was controlled (the amount of zinc), that element was tested for rarely and another parameter (chromium) of the waste stream that was contributing to regulatory consequence in the near future was given more priority. This was cyclic in nature. This approach indicated the presence of an informal feedback loop incorporated somewhere in the monitoring and measurement procedure. A feedback loop is a very efficient tool of communication ensuring the set procedures were in line to achieving the desired result.

Step 6: Suggestion

Determining regulatory compliance on a regular basis is important. Hence it is important to have procedure that systematically identifies, corrects and prevents violations. In fact the effectiveness of the compliance assessment process should be considered during EMS management review.

- The organizations could allow for flexibility in the procedure by making provisions for assessing what is the most important aspect of each significant impact at that time which poses the most legal liability. This allows for proper personal attention and time allocation. According to this if there is some aspect that needs to be taken care of; the personnel responsible could plan accordingly to act on the same. This needs an individual feedback mechanism to be incorporated to find out, in each time period (could vary from a week to a month) the progress on the existing procedure towards meeting the desired objective.
- A research conducted at the University Of Kalmar (UK), Department of Technology states that inputs from the feedback mechanism could be incorporated at the policy/decision making level through the management review process for deciding on future plans like eco-design, environmental engineering or recycling.
- The ultimate goal however is for organizations to look beyond just regulatory requirements i.e. they should also focus on the environment policy (may exceed just regulatory compliance) requirements and check if the desired goals are achieved. This in turn would ensure the organization towards a path of continual improvement.

Section 4.5 Checking and Corrective Action

4.5.1 Measurement and Evaluation:

Step 1

Case 2: Is there a designated person responsible for establishing and maintaining the procedures for the monitoring and measurement of key activities and processes with significant environmental impacts?

Step 2

Findings:

A. AMERICAN REFUEL - The EHS Manager was the one in charge of the documents. The EHS manager got forms, which indicated completion / updating of procedures duly filled in by the line supervisors. The line supervisors were the other contact for obtaining any records in the absence of the EHS Manager. The line supervisors were consulted and their approval was necessary to make any changes to the existing procedures that complied with their area of work directly such as operational incidents of a particular process. The EHS manager established the other procedures such as appropriate personal protection equipment needed for the different jobs.

B. CPS - The EHS/Quality Manager were primarily responsible for establishing the procedures for monitoring and measuring the key activities and processes with significant environmental impacts.

C. JAMESTOWN ELECTROPLATING - The EHS Personnel, which comprised of the EHS coordinator and the EHS Manger, established the procedures. The accountability however was primarily with the EHS coordinator as the EHS manager was also the Plant Manager.

D. DRESSER RAND - The EHS/Quality Personnel together decide the procedures for monitoring and measuring operations

E. ANOPLATE - The EHS/Quality Personnel together decide the procedures for monitoring and measuring operations but receive timely inputs from the line supervisors whenever clarifications are required.

F. ZOTOS - The EHS/Quality Personnel decide and maintain procedures for monitoring and measuring significant impacts of operations.

G. MAGENTIC TECHNOLOGIES - The EHS Personnel along with consultation with the quality manager decide procedures for monitoring and measuring significant impacts of operations.

TABLE 2: Categorization of findings:
Case 2: Designated person elected

Respondent	Category 1	Category 2	Category 3
	There is no designated person(s) establishing and maintaining procedures for monitoring and measuring key activities and processes that have significant environmental impacts.	▪ There is a designated person(s) for establishing and maintaining procedures for monitoring and measuring key activities and processes that have significant environmental impacts. ▪ No procedures are established to enlisting the criteria for a person(s) to be selected.	▪ There is a designated person(s) for establishing and maintaining procedures for monitoring and measuring key activities and processes that have significant environmental impacts. ▪ Procedures are established to enlisting the criteria for a person(s) to be selected.
American Refuel		1	
CPS		1	
Jamestown Electroplating		1	
Dresser Rand		1	
Anoplate		1	
Zotos		1	
Magentic Technologies		1	

Step 3: Scoring

Assigned Code	Respondent / Organization	Category 1	Category 2	Category 3	**Score for case 2**

A	American Refuel		1		**1**
B	CPS		1		**1**
C	Jamestown Electroplating		1		**1**
D	Dresser Rand		1		**1**
E	Anoplate		1		**1**
F	Zotos		1		**1**
G	Magentic Technologies		1		**1**

Step 4: Interpretation of results

All the respondents / organizations had a designated person(s) for establishing and maintaining procedures for monitoring and measuring key activities and processes that have significant environmental impacts. However, none of them had procedures established enlisting the criteria for a person(s) to be selected.

Step 5: Analysis

The organizations' EHS was primarily responsible for establishing and maintaining the procedures for the monitoring and measurement of key activities and processes with significant EHS impacts.

In some cases like organizations [D, E and F] it was the EHS/Quality personnel who was in charge. This is obvious in most SME's as the responsibilities are shared due to the nature of the business being less complicated. In most SME's the documentation procedures are more or less similar to the ISO 9000, which is a quality tool. Therefore the quality personnel handled the ISO 14001 requirements and were trained to handle quality related environmental issues also. This decision was usually based on the scale (regulatory liability) of business the organization was involved in and headcount issues thereof.

Step 6: Suggestions

*Small and medium -sized businesses may have an advantage over larger businesses in structuring their organizations for environmental management. Because personnel and other resources are generally more limited in small businesses, people often "*wear more than one hat*" and are experienced in performing multiple functions. In some cases, the individual responsible for environmental management in a small firm is also responsible for quality, health & safety, facility maintenance, or other related functions. For this reason, integrating environmental responsibilities with other functions can be greatly simplified.*

The EHS Representative is the primary point of contact for the auditors in case of ISO 14001 audits. Therefore it is appropriate that the EHS personnel have the ultimate responsibility of establishing and maintaining the procedures. However to ensure the adequacy of the established procedures input from line supervisors and any other personnel who have better technical knowledge should be consulted. When inputs are received from line supervisors and other appropriate personnel, reporting requirements should be established for the content of periodic or special reports. Care should be taken to ensure that reporting does not become an onerous task that unduly limits the other activities of the supervisor. In order to facilitate a direct communications link with EHS personnel, the supervisor could meet with EHS personnel on a periodic basis.

Section 4.5 Checking and Corrective Action

4.5.1 Measurement and Evaluation:

Step 1

Case 3: Are there established documents that ensure periodic evaluation of compliance with applicable EHS legislation, regulations and permits?

Step 2

Findings:

A. AMERICAN REFUEL - Periodic evaluation of compliance was carried out by EHS audits and internal inspections by the EHS manager.

B. CPS - Periodic evaluation of compliance was carried out by Quality audits, EMS/Compliance audits. The Quality Audits were mostly third party audits and the latter was an internal initiative conducted by the EHS manager and Quality Manager.

C. JAMESTOWN ELECTROPLATING - An Annual Audit by external party was conducted. The criteria for determining the performance indicators were regulations as in the legal liability each identified indicator posed. In addition to the regular inspections conducted by the EHS coordinator, self assessments were conducted by each person performing the activity.

D. DRESSER RAND - Monthly reviews based on need (regulations) were conducted. Annual audits by third party auditors were conducted.

E. ANOPLATE - Inspections based on job content and regulatory impact it had on the company were conducted by the EHS manager and the Quality Manager. In addition to that an annual third party audit was also conducted.

F. ZOTOS- Inspections were conducted by the EHS Manager on a monthly basis whereas the Quality Manager conducts inspections on a quarterly basis. The reason for this difference in time intervals was because EHS issues required relatively more attention than the quality issues as the EHS issues posed more regulatory binding and were not clearly defined as the quality issues. In addition, there were third party audits conducted annually.

G. MAGENTIC TECHNOLOGIES - Annual third party audits were conducted. In addition inspections were conducted by the EHS manager. The frequency was determined by the regulatory need i.e. when it was required by law.

TABLE 3: Categorization of findings:

Case 3: *Compliance with applicable EHS legislation, regulations and permits through documents established from periodic evaluation*

Respondent	Category 1	Category 2	Category 3
	There are no established documents that ensure periodic evaluation of compliance with applicable EHS legislation, regulations and permits.	Some procedures exist for evaluating compliance with relevant regulatory requirements but they either: Do not include a detailed evaluation of all requirements, or Do not cover all aspects of operations, products and services. Such evaluations are not conducted regularly or periodically.	Specific procedures have been established and are documented to evaluate regulatory compliance of all activities, products or services. Procedures include measures to identify and document the relevant regulatory requirements with which such activities, products or services must comply. Procedures establish the periodicity with which such evaluations must be conducted. Results of such evaluations are documented and reported to management.
American Refuel			2
CPS			2
Jamestown			2

Electroplating			
Dresser Rand			2
Anoplate			2
Zotos			2
Magentic Technologies			2

Step 3: Scoring

Assigned Code	Respondent / Organization	Category 1	Category 2	Category 3	**Score for case 3**
A	American Refuel			2	**2**
B	CPS			2	**2**
C	Jamestown Electroplating			2	**2**
D	Dresser Rand			2	**2**
E	Anoplate			2	**2**
F	Zotos			2	**2**
G	Magentic Technologies			2	**2**

Step 4: Interpretation of results

All the respondents / organizations have established documents that ensure periodic evaluation of compliance with applicable EHS legislation, regulations and permits.

Step 5: Analysis

Most organizations do have processes like internal audits, inspections, reviews for ensuring that, set procedures for monitoring and measurement have been carried out accordingly [B,C,D,E,F,G]. The time intervals however between these activities may

vary due to the complexity of the job content. The job content is analyzed in the light of the regulatory impact it poses [E].

Step 6: Suggestion

Audits could be carried out ensure that actual methods are adhering to documented procedures, while system reviews could be carried out periodically and systematically, to ensure the system achieves the required effect. There should be a schedule for conducting audits with different activities probably consisting of different frequencies. An audit should not be conducted in the aim to pointing out defects or irregularities but should establish facts rather than finding faults.

4.5.2 Non-conformance and Corrective and Preventive Action

Step 1

Case 4: Have procedures been established for defining responsibility and authority for handling and investigating nonconformance with EHS legal requirements and the with the organization's environmental policy or policies, objectives and targets?

Step 2

Findings:

A. AMERICAN REFUEL – The organization has a corrective action process in place. There is a form that gets filled up by the auditor/reviewer and given to the line staff (whoever is directly performing the task) to implement the corrective action. There is a time frame specified for the corrective action.

B. CPS – The organization has a process abbreviated as the CAR (Corrective Action Response) in place. This consists of a specific form that lists the legal requirements for each activity, the policy and objectives and targets. In addition to this, the CAR could be initiated by anybody in the organization in case of an 1) interdepartmental issue, 2) customer complaint, 3) internal audit, 4) compliance audits, 5) intradepartmental observations, 6) vendor reviews and 7) management review. This is a computerized system.

C. JAMESTOWN ELECTROPLATING – Corrective and preventive actions are initiated following an audit or review. There is a corrective action coordinate who is responsible for directing the corrective action required to the responsible line staff and ensuring it is being done in the specified time frame. Both the corrective action coordinator and the line staff are required to sign the paper work on completion of the task. Preventive action is usually initiated by the EHS manager and/or the auditor.

D. DRESSER RAND - The organization has a corrective / preventive action plan which 1) identifies the deficiencies through an audit or review, 2) provides resources (labor, technical expertise, and equipment) to fix the problem and 3) documents the corrective/preventive action. The quality manager is responsible for monitoring the whole process.

E. ANOPLATE - The organization has a computerized corrective action system. The auditor or reviewer or any employee enters any non-conformities observed against the pre-determined criteria in the system. The non-conformities are classified into three areas, which are – regulatory violation, policy violation or probability of a violation. Once the non-conformity is entered in the system EHS/quality personnel evaluates the observation and directs it to the appropriate line personnel for initiating the necessary corrective/preventive action.

F. ZOTOS - The organization has established a safety committee comprises of both management and shop floor representatives. The committee as a whole reviews all corrective/preventive actions initiated either through an audit, internal review or self observation.

G. MAGENTIC TECHNOLOGIES – Audits are conducted, both internal and external on a regular frequency. The corrective/preventive action process is initiated by the audit results. The non-conformances are traced back to the task it relates and the circumstances under which it occurred. After this investigation, the personnel performing the task is contacted to implement the necessary corrective/preventive action. The process is overseen by the EHS manager.

TABLE 4: Categorization of findings:
Case 4: Procedures for Handling and Investigating Nonconformance

Respondent	Category 1	Category 2	Category 3
	Management has not established procedures for defining responsibility and authority for handling potential non-conformance and taking corrective action.	Procedures for defining responsibility and authority for handling and investigating potential non-conformance and taking corrective action. These procedures are not updated in light of experience with actual situations of non-conformity.	Procedures for defining responsibility and authority for handling and investigating potential non-conformance and taking corrective action. Procedures have been established and documented for defining responsibility and authority for taking action to mitigate any impacts caused by non-conformance and for initiating and completing corrective and preventive action.
American Refuel		1	
CPS			2
Jamestown Electroplating		1	
Dresser Rand			2
Anoplate			2
Zotos		1	
Magnetic Technologies		1	

Self Observation: Most organizations find it difficult to assign responsibility to one person for tracking any non-conformity with regulations or internal policies. Although, the task is performed by a group of people which may include, the EHS representative, quality representative and/or employee (line staff). The circumstance thus, makes it difficult to hold a single person accountable for fixing the any non-conformances.

Step 3: Scoring

Assigned Code	Respondent / Organization	Category 1	Category 2	Category 3	**Score for case 4**
A	American Refuel		1		**1**
B	CPS			2	**2**
C	Jamestown Electroplating		1		**1**
D	Dresser Rand			2	**2**
E	Anoplate			2	**2**
F	Zotos		1		**1**
G	Magnetic Technologies		1		**1**

Step 4: Interpretation of Results

The organizations A, C, F and G have procedures for defining responsibility and authority for handling and investigating any potential non-conformances and initiate the necessary corrective/preventive actions. However, these procedures are updated with the actual situations or changes occurring with time. In contrast, organizations B, D and E document the entire process from observing changes to be made according to regulatory changes in the policies and thereby the processes which otherwise may lead to non-conformance. Documentation allows for control of the system as it requires accountability at all steps of the process, from observing and making the changes and reviewing the processes to check for non-conformances, if any.

Step 5: Analysis

The organizations A, C, F and G involve more than one person to be responsible for handling any non-conformances. This happens mainly because there is no single head count for managing EHS. Staff wear multiple hats based on the business needs of the organization. Thus this makes it hard for the person responsible to prioritize on EMS issues. Due to lack of time and expertise, the approach is rather reactive to any non-conformance than proactive.

The organizations B, D and E, however have the luxury of time to be able to update themselves on the changes regulatory requirements and make appropriate changes in their internal processes and policies. This allows them to conduct EHS inspections on a regular basis to observe any non-conformances that may occur after training the employees on the changes. The approach is proactive here initiating both corrective and preventive actions. Documentation of the whole process from the get go allows the person (s) responsible to refer back in case of repetition saving time as they do not have to reinvent the wheel.

Often there is a misconception with assigning a head count to EHS activities especially in SME's as the whole realm of the EMS is not known to the staff.

Step 6: Suggestion

It is important for any organization to have a designated person for managing the EMS. Most times however, due to cost factors many SME's think of it to be impossible. If SME's consider the regulatory liability issues, it would favor the thought of designating a person to EHS activities. Due to lack of time and labor, SME's often have no information on their EHS performance. Although multidimensional teams are very effective in management, the need of expertise in the area is essential due the dynamic regulatory world.

There needs to be a procedure in place that provides a mechanism for all employees to report EHS hazardous situations. This procedure also needs to provide a process for appropriate corrective/preventive action to take place.

Organizations need a procedure for defining responsibility and authority for handling and investigating non-conformances, for taking action to mitigate impacts, and for initiating and completing corrective and preventive action. Any changes in procedures resulting from corrective and preventive actions should be implemented and recorded. The Environmental Coordinator could maintain these records.

The Environmental Coordinator could design an EHS inspection at regular frequencies to evaluate the actual practices versus the EMS requirements. A multifunctional team could help with the inspections. However, any discrepancies would be documented and corrected appropriately under the supervision of the Environmental Coordinator.

4.5.2 Non-conformance and Corrective and Preventive Action

Step 1

Case 5: Have procedures been established for determining the corrective and preventive action accordingly?

Step 2

Findings:

A. AMERICAN REFUEL – The organization Corrective Action process is established.

B. CPS – The (Corrective Action Response) CAR is the procedure established.

C. JAMESTOWN ELECTROPLATING – Yes, the process explained in case 4 is what is followed and documented.

D. DRESSER RAND - Yes, as explained in case 4.

E. ANOPLATE - Yes, a computerized system exists.

F. ZOTOS - Yes, as stated in case 4.

G. MAGENTIC TECHNOLOGIES – Yes, the EHS personnel decides the appropriate corrective/preventive action based on the task and consults the same with the staff performing the task.

TABLE 5: Categorization of findings:

Case 5: *Procedures for Determining the Corrective and Preventive Action*

Respondent	Category 1	Category 2	Category 3
	Incidences of non-conformance are not investigated to determine corrective or preventive actions.	Corrective or preventive actions are often "stop-gap" measures that do not fully reflect the magnitude of the problem or are not fully commensurate with the EHS impact encountered.	Corrective or preventive action taken to eliminate the causes of actual and potential non-conformance are always appropriate to the magnitude of problems and commensurate with the environmental impact encountered. Any changes in the written operating procedures resulting from corrective and preventive action have been implemented and recorded.
American Refuel		1	
CPS		1	
Jamestown Electroplating		1	
Dresser Rand		1	
Anoplate		1	
Zotos		1	
Magnetic Technologies		1	

Step 3: Scoring

Assigned Code	Respondent / Organization	Category 1	Category 2	Category 3	**Score for case 5**
A	American Refuel		1		**1**
B	CPS		1		**1**
C	Jamestown Electroplating		1		**1**
D	Dresser Rand		1		**1**
E	Anoplate		1		**1**
F	Zotos		1		**1**
G	Magnetic Technologies		1		**1**

Step 4: Interpretation of Results

All the organizations have established a procedure for taking the necessary corrective or preventive action (s). However, it is not ensured that these corrective and/or preventive actions implemented reflect the magnitude of the problem.

Step 5: Analysis

Due to the lack of resources such as labor and time, most SME's are reactive in their approach towards EHS management. Regulatory compliance is their short-term goal. However, the cost of repetition is neglected. This could be attributed to the lack of documentation also. SME's today deal with business challenges and do not have the luxury of resources to think for tomorrow. The market place on the other hand demands businesses to be on top of things. The pressure is indeed high.

Step 6: Suggestion

Corrective action can be divided into two sets of actions. The first, which can be termed **remedial action**, deals with the immediate problem. The second action is defined in ISO 17025 as **cause analysis**. This action requires the question "Why did it go wrong?" to be asked instead of just "What has gone wrong?" Often the non-conformance is merely the symptom of an underlying problem. By looking deeper into the system, the root cause of a problem may be found and by implementing corrective action, the recurrence of a similar non-conformance would be reduced. It may already be common practice to analyze the cause of any non-conformances that occur, but to comply with ISO 17025 a more systematic approach is needed.

Although cause analysis can be achieved partly by staff training, by raising awareness among staff, it is more effective to incorporate the procedure into the system by introducing a section relating to cause analysis into any non-conformance notes.

The area where the non-conformance occurred should be revisited at a later stage to determine the efficiency of corrective action possibly during an appropriate internal quality audit.

However, there will not always be a deep-seated problem within the system that has resulted in the occurrence of a non-conformance. The remedial action may be sufficient to eliminate the problem.

In practice, implementing corrective action within the management system does not require documentation of a new procedure. It merely requires existing procedures for dealing with non-conformances and internal audit could include cause analysis as part of the process. However, documentation often prevents reinventing the wheel as it acts as a good reference guide.

There are two aspects to preventive action. The first is **risk assessment** and the second is **continuous improvement**. It could be assumed that every activity performed can break down. There are many procedures in place to prevent these failures from occurring such as staff training, servicing equipment, monitoring equipment, validating methods, use of quality control, etc.

Consequently, there is a high degree of confidence that these procedures are effective and correct results are obtained. A risk assessment must be performed when any new procedure is introduced any change to an existing procedure takes place.

In most situations, any new procedure undertaking involves adaptation of existing procedures of which the organization has considerable experience. Therefore, it is sufficient to document the new procedure, ensuring due consideration has been given to all important critical control points and any risks associated with all activities within the process. The Standard Operating Procedure should address these factors.

Occasionally, a new procedure might be undertaken which is complex and of which there is little experience. In this situation, it is advisable to perform a more formal risk assessment of the procedure. Typically, this may involve producing a flowchart of the procedure, incorporating all key steps, documenting all the possible risks associated with each step, documenting how these risks should be minimized, and lastly documenting the procedure, taking into account all the critical control points.

The new process should be reassessed after it has been used a few times and any amendments can be made, as indicated. The whole process should generate records that should be filed as evidence that risk assessment (or preventive action) has taken place. It is important to judge when it is appropriate to adopt this rigorous approach to risk assessing a process as it is time consuming and laborious for SME’s especially.

The effectiveness of the procedure could be ascertained by means of ongoing internal quality audit and internal and external assessment.

4.5.2 Non-conformance and Corrective and Preventive Action

Step 1

Case 6: Does your organization have a system to evaluate the appropriateness of corrective or preventive action, by reviewing causes, trends and patterns, and environmental impacts of nonconformance?

Step 2

Findings:

A. AMERICAN REFUEL – The person responsible for the corrective action has to sign off on the form on completion of the task. The auditor/reviewer reviews this information prior to future audits/reviews.

B. CPS – Since the established process of the organization, the CAR is a computerized process, when an action is initiated the email is directed to the responsible person. The management representatives consisting of the supervisor and the EHS staff responsible is copied on the email. This data is used for while conducting future audits.

C. JAMESTOWN ELECTROPLATING – The Corrective Action Coordinator evaluates the appropriateness of the corrective action taken and implement steps (training, task process review) to avoid reoccurrence. The EHS manager and the auditor are primarily responsible for the preventive action. They implement next steps in case they see a probability of a violation or unsafe behavior/circumstance occurring.

D. DRESSER RAND - The quality manager initiates the corrective / preventive action based on the observations made during an audit or internal review. A form is filled out by the person responsible for fixing the problem, which is, usually the line supervisor. In the form, the person responsible commits to a time line and requests for necessary resources needed to fix the problem.

E. ANOPLATE - Each corrective/ preventive action initiated is reviewed by the EHS / quality personnel based on regulatory liability and internal policies. They in turn suggest the appropriate corrective/ preventive action to be implemented. They also provide the necessary resources for the task.

F. ZOTOS - The committee brainstorms on all observations. The root-cause analysis is carried out for each observation. This is used as the basis to decide the appropriate corrective/preventive action.

G. MAGENTIC TECHNOLOGIES – Audits are conducted at regular intervals. The observations are compared to the previous observation.

TABLE 6: Categorization of findings:

Case 6: *Evaluate the Appropriateness of Corrective and/or Preventive action,*

Respondent	Category 1	Category 2	Category 3
	There are no procedures to evaluate the appropriateness of corrective or preventive actions taken. No procedures exist to verify compliance with relevant EHS legislation and regulations.	Procedures have been established for monitoring on a regular basis some of the key characteristics of the operations and activities that form a basis on deciding whether the corrective or preventive action initiated was appropriate. Procedures stated above have not been documented.	Procedures have been established for monitoring on a regular basis some of the key characteristics of the operations and activities that form a basis on deciding whether the corrective or preventive action initiated was appropriate. Procedure require the recording of information to track performance, relevant operational controls and conformance with the organization's objectives and targets. These procedures have been documented and are reviewed regularly.
American Refuel		1	
CPS		1	
Jamestown Electroplating		1	
Dresser Rand		1	

Anoplate		1	
Zotos		1	
Magnetic Technologies		1	
Self Observation: Most SME's due to lack of resources like time and labor are reactive in their approach to EHS management. Therefore, they often provide remedial solutions to non-conformances. Though the findings of the previous audits are used as a reference for future audits, there is no guarantee that the same observations may be made again.			

Step 3: Scoring

Assigned Code	Respondent / Organization	Category 1	Category 2	Category 3	**Score for case 6**
A	American Refuel		1		**1**
B	CPS		1		**1**
C	Jamestown Electroplating		1		**1**
D	Dresser Rand		1		**1**
E	Anoplate		1		**1**
F	Zotos		1		**1**
G	Magnetic Technologies		1		**1**

Step 4: Interpretation of Results

All the organizations have procedures to monitor key characteristics on a regular basis to assess whether the corrective/preventive actions implemented were appropriate. Most SME's have regular internal and external audits scheduled.

Step 5: Analysis

Though the ISO 14001 requires the assessment of the appropriateness of the corrective/preventive action implemented. Little or no information is required to be documented. SME's being short of staff (expertise) and time often approach all EMS problems in a reactive manner. Most times lack of accountability does not hold anyone responsible if the same observations re-appear in a future audit.

Step 6: Suggestion

Key steps to identifying trends include:

- Identify the problem;
- Investigate to identify the root cause;
- Come up with the solution;
- Implement the solution;
- Document the solution;
- Communicate the solution; and
- Evaluate the effectiveness of the solution.

In evaluating the effectiveness of corrective and preventive action systems, an internal or external assessor should verify that procedures are being followed. In particular, that the appropriate forms are being utilized (some processes may require the use of a special format); that the actions taken are appropriate in consideration of the non-conformances identified; and, that established deadlines for identifying, completing, and closing actions have been met.

An assessor will not expect maximum due dates in procedures to be established (e.g. corrective actions must be complete within 15 days). An effective system can have due dates which are based on time lines agreed upon by the person initiating the action request and the person responsible for completing the action. This allows time lines to be established based on the seriousness of the problem and the action necessary. A system could also allow for an extension of due dates by an authorized person. An

effective system usually includes a database or spreadsheet for tracking completion of actions and follow-ups.

The most effective systems have the support of all employees. When corrective and preventive systems are viewed by all as a tool to improve the business and lower costs, they become very powerful. Assessors are limited in their ability to evaluate a system since they can only verify compliance to documented procedures. The real effectiveness of corrective and preventive action systems should be evaluated by measuring changes in areas such as customer satisfaction (e.g. product salability and repeat business), failure costs (e.g. rework/retest time, and scrap), engineering change activity, and employee morale.

4.5.2 Non-conformance and Corrective and Preventive Action

Step 1

Case 7: Does your organization provide for prioritization of a corrective / preventive action needed to ensure the action is commensurate in lowering the risks to acceptable levels?

Step 2

Findings:

A. AMERICAN REFUEL – No, issues are addressed as and when they arise.

B. CPS – There is no written policy on prioritizing corrective action, however, the issues that pose the most regulatory consequences are attended to first.

C. JAMESTOWN ELECTROPLATING – The Corrective Action Coordinator, EHS Manager or Auditor base their decisions on implementing any corrective/preventive action on the regulatory impact the action poses.

D. DRESSER RAND - Based on the regulatory impact the various problems pose, the quality manager allocates time and resources to implement corrective / preventive action.

E. ANOPLATE - Regulatory liability is the most important factor in prioritizing the corrective/preventive action.

F. ZOTOS - The observations are sorted into the effect they pose, regulatory liability or internal policy/procedure violation or both. The observations that pose a regulatory liability get attended to first.

G. MAGENTIC TECHNOLOGIES –Usually the observations that pose maximum liability issues are attended to first.

TABLE 7: Categorization of findings:

Case 7: *Process to prioritize Corrective / Preventive Action to lower risks*

Respondent	Category 1	Category 2	Category 3
	There are procedures for evaluating regulatory compliance.	Some procedures exist for evaluating compliance with relevant regulatory requirements but they are: ▪ Do not include a detailed evaluation of all requirements, or ▪ Do not cover all aspects of operations, products and services. Such evaluations are not conducted regularly.	Specific procedures have been established and are documented to evaluate regulatory compliance of all activities, products or services. Procedures include measures to identify and document the relevant regulatory requirements with which such activities, products or services must comply. Procedures establish the periodicity with which such evaluations must be conducted. Results of such evaluations are documented and reported to management.
American Refuel		1	
CPS		1	

Jamestown Electroplating		1	
Dresser Rand		1	
Anoplate		1	
Zotos		1	
Magnetic Technologies		1	

Step 3: Scoring

Assigned Code	Respondent / Organization	Category 1	Category 2	Category 3	**Score for case 7**
A	American Refuel		1		**1**
B	CPS		1		**1**
C	Jamestown Electroplating		1		**1**
D	Dresser Rand		1		**1**
E	Anoplate		1		**1**
F	Zotos		1		**1**
G	Magnetic Technologies		1		**1**

Step 4: Interpretation of Results

All the organizations have a method of assessing their non-conformances against regulatory liability which they may pose. Fines being a financial burden forces SME's to attend to any discrepancy that may result in a regulatory violation.

Step 5: Analysis

The enforcement of regulations in the United States, keeps most SME's even on their guard. This however, again is a reactive approach. The preventive approach described in Case – should be adapted to lessen liability and cost from the beginning.

Step 6: Suggestion

Similar to the planning stages of the ISO 14001, on the identification of a non-conformance, SME's should categorize them into the environmental impact area identified in the beginning of ISO 14001 implementation. Accordingly, the legal requirements of each EHS impact would enable further categorization of the non-conformances into three classes, namely – [A] Needs Immediate Attention, [B] Needs Moderate Attention and [C] Could be considered later. Then all the action items under [A] could be considered for next steps such as, What resources are needed to fix the non-conformance? What would be the cost? How many people are to be involved? How long it would take to complete the action item?

4.5.3 Records

Step 1

Case 8: Does your company have procedures for the identification, maintenance and disposition of environmental records been established and maintained?

Step 2

Findings:

A. AMERICAN REFUEL- All audits reports and corrective actions taken are filed by date. However, there is not procedure established for maintenance and updating the records.

B. CPS- Informal record keeping is carried out. The organization follows the same framework as required by ISO 9000 with modifications required by ISO 14001. There is no established procedure to ensure the same.

C. JAMESTOWN ELECTROPLATING – The records are controlled by the quality and/or EHS staff.

D. DRESSER RAND - The same record keeping procedures required for ISO 9000 documentation control with slight modifications are followed.

E. ANOPLATE - The organization follows the template established for ISO 9000 documentation for ISO 14001 documentation control.

F. ZOTOS- The organization maintains all records that are of regulatory requirement including ISO 14001 records. The organization prioritizes the corrective actions required based on its business and EHS impact. All records can be easily located as they are

filed based on date and importance of findings. However, there is no firm procedure established to ensure maintenance and disposition.

G. MAGENTIC TECHNOLOGIES- The organization maintains all records required by regulations.

Note: Record keeping for ISO 9000 requirements:

There are eighteen required “quality records” within ISO 9001. The required quality records list includes:

1. · record of management review
2. · record of contract review
3. · record of design review
4. · record of design verification and validation measurements
5. · record of design changes
6. · record of document changes
7. · records of acceptable sub-contractors
8. · record of unsuitable customer owned product
9. · record of identification
10. · records of qualified processes, equipment, and personnel
11. · record of product release prior to verification
12. · record of inspection
13. · record of calibration
14. · record of condition of accepted non-conforming product
15. · record of results of investigation
16. · record of audit results
17. · record of follow-up activities and corrective actions
18. · record of training

In addition to the above, ISO 14000 supporting documents include environmental labeling, life-cycle assessment, environmental aspects in product standards, and environmental performance evaluation.

TABLE 8: Categorization of findings:

Case 8: *Procedures to identify and maintain appropriate records.*

Respondent	Category 1	Category 2	Category 3
	There were no procedures to identify, maintain and/or disposition of environmental records.	Procedures for the identification, maintenance and disposition of some environmental records have been established. Not all records relative to conformance to the ISO 14001 standard are maintained.	Procedures for the identification, maintenance and disposition of some environmental records have been established. All records required to demonstrate conformity to the standard and regulatory requirement are maintained.
American Refuel		1	
CPS		1	
Jamestown Electroplating		1	
Dresser Rand		1	
Anoplate		1	
Zotos		1	
Magnetic Technologies		1	
Self Observation: *The general practice is to maintain all records that seem to have regulatory impact. The easiest sorting method followed by all the respondents is to organize the records by date. The whole documentation aspect, being labor and time intensive was not given much importance.*			

Step 3: Scoring

Assigned Code	Respondent / Organization	Category 1	Category 2	Category 3	**Score for case 8**
A	American Refuel		1		**1**
B	CPS		1		**1**
C	Jamestown Electroplating		1		**1**
D	Dresser Rand		1		**1**
E	Anoplate		1		**1**
F	Zotos		1		**1**
G	Magnetic Technologies		1		**1**

Step 4: Interpretation of Results

All the respondents / organizations seem to follow the ISO 9000 framework for record keeping. Although, B, C, D, E, F and G mention they have incorporated the ISO 14001 requirements, there are procedures established to ensure the same.

Step 5: Analysis

The organizations mostly adapted the ISO 9000 requirements and framework for record keeping. It comes across clearly that SME's due to the lack of resources (time, labor and technology) were unable to establish procedures to ensure all of ISO 14001 record keeping requirements were complied with. Although, organizing the records by date seems most logical, it does not favor identification of records based on environmental impacts that needed corrective actions. There is possibility of loosing attention on some key corrective actions observed during audits. The methods followed by C and F helped this issue to some extent. The organizations (C, F) further sorted their records based on corrective actions – pending items and closed. F went a step further by sorting the pending items based on the environmental impact the audit findings posed.

Step 6: Suggestion

Effective record keeping methods could be achieved by the following steps:

- To file the audits/reviews conducted as a report by date. This report should consist of a Corrective Action Response letter, stating the observations and responsible person for completing the corrective action required by a specific time line established. The time line could vary depending on the extent of corrective action needed and regulatory impact of the observation.
- To organize the audit findings based on the environmental aspect.
- To separate the pending action items from completed items.
- All training conducted should be recorded.
- All records based on regulatory time frame could be organized and updated.
- Back –up of all records is necessary to prevent unaccepted incidents that may destroy records.

4.5.3 Records

Step 1

Case 9: Do the EHS records include training records, results of audits / reviews, information on responsibilities?

Step 2

Findings:

A. AMERICAN REFUEL – Only training records and results of audits / reviews are maintained.

B. CPS – Training records, audits records and organization chart is kept. Information on specific responsibilities are not kept. Follow the ISO 9000 requirements with modifications for ISO 14001 requirements.

C. JAMESTOWN ELECTROPLATING – The records maintained include training and audit records but does not include too much information on the responsibilities.

D. DRESSER RAND - The same process followed for ISO 9000 is followed. Hence there is information on the responsibilities for the various aspects of ISO 14001.

E. ANOPLATE - All required records are maintained which includes training, auditing and responsibilities. Follow the ISO 9000 requirements with modifications for ISO 14001 requirements.

F. ZOTOS - Yes, the organization has all records required by the regulations. The responsibilities are usually a part of the policies.

G. MAGENTIC TECHNOLOGIES- The organization has all records required by the regulations. The responsibilities are usually a part of the policies.

TABLE 9: Categorization of findings:

Case 9: *Type of Records – training, audits etc.*

Respondent	Category 1	Category 2	Category 3
	The records do not include training records, results of audits / reviews, information on responsibilities.	Not all records relative to conformance to the ISO 14001 standard are maintained.	All records required to demonstrate conformity to the ISO 14001 standard (including regulatory compliance) are maintained.
American Refuel		1	
CPS		1	
Jamestown Electroplating		1	
Dresser Rand		1	
Anoplate		1	
Zotos		1	
Magnetic Technologies		1	
Self Observation: Record keeping being a tiresome and time consuming process does not allow most SME's to maintain all documents needed by the standard. The responsibility is not documented as there are various personnel responsible of each aspect of the EMS.			

Step 3: Scoring

Assigned Code	Respondent / Organization	Category 1	Category 2	Category 3	**Score for case 9**
A	American Refuel		1		**1**
B	CPS		1		**1**
C	Jamestown Electroplating		1		**1**
D	Dresser Rand		1		**1**
E	Anoplate		1		**1**
F	Zotos		1		**1**
G	Magnetic Technologies		1		**1**

Step 4: Interpretation of Results

All the organizations maintain key records required by regulatory standards. In addition, some the records required by the standard are maintained.

Step 5: Analysis

One area affording flexibility in the ISO 14001 standard is documentation. Unlike ISO 9001:1994, ISO 14001 does not require a great deal of documentation. [In fact, besides alignment of content with ISO 14001, ISO 9001:2000 has reduced the number of procedures requiring documentation.] ISO 14001 requires that the organization (s) develop documentation that describes how the core elements work, and their interaction. Beyond that description there are only three places where documented procedures are required: operational control to manage significant environmental impacts, procedures to monitor and measure environmental performance, and performing periodic evaluations of compliance with legal and regulatory requirements.

Some organizations like A, C, F and G would have required a lot of documentation to meet this requirement, and others like B, D and E would have required very little. This comes as a big change to organizations B, D and E who are used to the ISO 9001:1994 standard, where a documented procedure is required for each of the numbered elements of the standard.

Step 6: Suggestion

ISO 14001 requires the following types of records to be maintained:

- Aspect identification and significant evaluation records
- Objectives, targets, and management program records
- Subcontractor evaluation and monitoring records
- Material and waste management records
- Environmental performance monitoring records
- Calibration certificates
- Operational controls and maintenance records
- Training records
- Emergency preparedness and response records
- Corrective and preventive action records
- External communication records
- Internal EMS audit reports
- Management review records

4.5.3 Records

Step 1

Case 10: Are the records legible, identifiable and traceable through sampling records?

Step 2

Findings:

A. AMERICAN REFUEL – The records are identifiable as they are organized by date.

B. CPS –Date is used as the basis for record keeping.

C. JAMESTOWN ELECTROPLATING – Records are dated and corrective action items are transferred to separate files namely, action pending and closed. Yearly, the files are reviewed based on regulatory requirement and corrective action status. The old files, if needed to be kept due to regulatory requirement are moved to an office owned storage cabinets. Only pending corrective action items with the current audit reports are kept in the office area. There is no written policy on this.

D. DRESSER RAND - The documentation procedures followed are similar to ISO 9000.

E. ANOPLATE - The documentation procedures followed are similar to ISO 9000.

F. ZOTOS - Regulatory requirement is the basis of what records get retained, the forms required and the time frame for maintaining these records.

G. MAGENTIC TECHNOLOGIES- The records are organized according to the various EHS regulatory requirements. This enables easy access. There is a general audit report file organized by date that is maintained in addition.

TABLE 10: Categorization of findings:

Case 10: *Are the records legible, identifiable and traceable through sampling records?*

Respondent	Category 1	Category 2	Category 3
	The records are not legible, identifiable and traceable through sampling records.	Some records are not legible and identifiable but cannot be traced through sampling records.	All records are not legible, identifiable and traceable through sampling records.
American Refuel		1	
CPS		1	
Jamestown Electroplating		1	
Dresser Rand		1	
Anoplate		1	
Zotos		1	
Magnetic Technologies		1	

Step 3: Scoring

Assigned Code	Respondent / Organization	Category 1	Category 2	Category 3	**Score for case 10**
A	American Refuel		1		**1**
B	CPS		1		**1**
C	Jamestown Electroplating		1		**1**
D	Dresser Rand		1		**1**
E	Anoplate		1		**1**
F	Zotos		1		**1**
G	Magnetic Technologies		1		**1**

Step 4: Interpretation of Results

All organizations have maintained the required records according to the standard. However, none of them have maintained the records in such a manner that would enable a sample to be the representative of records maintained.

Step 5: Analysis

Lack of sufficient labor and time seem the problem of most SME's in establishing a record management system. Consultants may not affordable because of the cost factor. However, SME's that are already ISO 9000 certified found it rather easy to implement documentation processes for ISO 14001 as the requirements were not as tiresome and abundant.

Step 6: Suggestion

Filing systems **-** A good filing system is one that permits easy, economical and efficient organization, maintenance and protection of documents in current use. A filing system should

- Reflect the functions of the EMS
- Have a structured numeric or alpha-numeric referencing system in which each element equates with elements of the EMS

File naming and maintenance

- All documents on a file should bear the file reference number
- File titles should clearly identify file contents
- File titles should never be generic, such as "miscellaneous"
- File covers should be printed to permit the title, reference and date of opening and closing of the file
- Documents should be filed in reverse order

- A new file should be opened if a new subject develops, rendering the original file title inaccurate
- Files should be closed when the business to which they relate has been completed. Closed files should be removed to a suitable storage facility.

Classification of files:

The management of records and the information they contain becomes easier when they are organized according to a classification system. Classification means the arranging, or grouping, of records according to a logical scheme, ideally based on the activities that generate them. Classification schemes usually require the organization of records relating a particular element of the EMS or groups of sub-elements or group of a sub-sub-element. These groups are then allocated reference numbers or codes, which serve as unique identifiers and also indicate the inter-relationship between the groups.

- For efficiency, order, continuity and ease of retrieval, related records are usually managed by their accumulation into folders or files. Each file should bear the reference code or number of the group of which it forms a part, and also have its own unique reference number within the group.
- The file titles composed for files should reflect their contents accurately. It is recommended that file titles should also indicate the groups of which they form part. Therefore, primary and, if necessary, secondary titles, representing sub-groups within each of the functional areas, may then be devised.

For example, a primary title might be 'Building maintenance', and under 'Building maintenance' ' secondary titles might include 'Cleaning contracts' and 'Fire prevention'. Tertiary titles under 'Cleaning contracts' could include an alphabetical list of contractors.

In this manner, order is maintained by putting records of a similar category together, thus enhancing the flow of information.

4.5.3 Records

Step 1

Case 11: Are the EHS records stored in such a way as to be readily retrievable and protected against damage, deterioration or loss?

Step 2

Findings:

A. AMERICAN REFUEL – The records are kept right in the EHS office area. The volume of records maintained does not favor immediate removal.
B. CPS- All records are maintained in file cabinets. The cabinets are located in the EHS and quality departments.
C. JAMESTOWN ELECTROPLATING – Old records are stored in an off-site facility. The current records are kept in the EHS office area. However, there are no emergency exits to even the personnel in the office area.
D. DRESSER RAND - The quality department maintains all the required documentation in file cabinets. All computerized documentation has a back up file in addition.
E. ANOPLATE - Due to lack of space and labor, all the records (new and old) are kept in filing racks in a designated area in the office space.
F. ZOTOS - Some records are maintained in the EHS office area. Most of records are in designated storage.
G. MAGENTIC TECHNOLOGIES- All records are kept in binders on shelves in the office area.

TABLE 11: Categorization of findings:

Case 11: *Are records stored appropriately?*

Respondent	Category 1	Category 2	Category 3
	No environmental records are stored or maintained in a manner that they can be readily retrieved and protected against damage, deterioration or loss.	Certain environmental records are stored and maintained in such a way that they are readily retrievable and protected against damage, deterioration or loss. Retention times are not always established or recorded.	All the environmental records are stored and maintained in a manner that they are readily retrievable and protected against damage, deterioration or loss. The retention times of the various EHS records are established and recorded.
American Refuel		1	
CPS		1	
Jamestown Electroplating		1	
Dresser Rand		1	
Anoplate		1	
Zotos		1	
Magnetic Technologies		1	

Step 3: Scoring

Assigned Code	Respondent / Organization	Category 1	Category 2	Category 3	**Score for case 11**
A	American Refuel		1		**1**
B	CPS		1		**1**
C	Jamestown Electroplating		1		**1**
D	Dresser Rand		1		**1**
E	Anoplate		1		**1**
F	Zotos		1		**1**
G	Magnetic Technologies		1		**1**

Step 4: Interpretation of Results

All organizations seem to have established methods to store records that enabled them to be readily retrieved. Organization D had a computerized system which made it more convenient to organize and retrieve. However, none of the organizations could establish procedures on retention.

Step 5: Analysis

All documents required to be maintained by ISO 14001 are to be periodically reviewed, revised as necessary and approved for adequacy by authorized personnel. Therefore, it requires expertise to know the changing regulations and the ISO 14001 standard. The standard requires current versions of relevant documents to be available at all locations where operations essential to effective functioning of the environmental management system are performed. Obsolete documents are required to be promptly removed from all points of issue and points of use, or otherwise assured against unintended use. Any

obsolete documents retained for legal and/or knowledge preservation purposes should be suitably identified.

Documentation shall be legible, dated (with dates of revision) and readily identifiable. Procedures and responsibilities are required to be established and maintained concerning the creation and modification of the various types of documents related to the standard.

For SME's where most times the EHS person is also performing other tasks like quality, human resources, purchasing or even technical support, hence the requirement of the standard is overwhelming. However, SME's that are already ISO 9000 certified could adapt the documentation process already in place and modified it to suit the ISO 14001 requirements.

Step 6: Suggestion

The records retention schedule should specify the length of time that records must be maintained for organizational, legal, fiscal and any other purposes.

The records retention schedule:

- Names the content and purpose of each record of group of records,
- Prescribes the necessary retention period based on its purpose.

The retention period will range from immediate destruction or destruction after a period of time, to permanent retention. Some records need not be scheduled at all as they are transitory and only required for a limited period of time for convenient reference. A small percentage of records are temporary and, though scheduled, can be destroyed almost immediately after use. The retention period for should considered on an ongoing basis as most times the economic cost of retaining them exceeds their value.

Before scheduling, it is necessary to take an inventory of all records.

There is no strict format or layout for the schedule: tables, charts, or forms and reports tailored to meet the organizations needs are satisfactory. It is inadvisable to copy

schedules from another organization as it will not meet the administrative and operational needs of users.

4.5.4 Audits

Step 1

Case 12: Does the organization have (a) program (s) and procedures for periodic EMS audits?

Step 2

Findings:

A. AMERICAN REFUEL – The organization has an annual external audit and bimonthly internal audits. On a weekly basis there is a “steer step meeting” where the EHS related matters are discussed by a group of people namely – the Plant Manager, EHS Manager and employee representatives. In case of any action to be initiated, the information is conveyed to the local area supervisors by the Plant Manager. The line supervisors further convey this message to their teams.

B. CPS – Annual external audit and monthly EHS walk through are conducted. The CAR (Corrective Action Response) system enables all employees to initiate a corrective/ preventive action whenever an observation deems it.

C. JAMESTOWN ELECTROPLATING – The size of the organization being very small (50 persons), EHS issues are looked into informally on a daily basis. Formal inspections are conducted once in six months. Consultants help with this process. Annual external audit is conducted according to regulatory requirement.

D. DRESSER RAND- Monthly inspections are conducted by the management staff.

E. ANOPLATE - There is a safety committee that conducts monthly inspections.

F. ZOTOS - The internal inspections are combined with the quality department's inspections. Specific EHS audits are conducted annually.

G. MAGENTIC TECHNOLOGIES- External annual audits and monthly EHS inspections are conducted.

TABLE 12: Categorization of findings:

Case 12: *Program for regular audits*

Respondent	Category 1	Category 2	Category 3
	No audit procedures have been established.	Audit procedures are not fully comprehensive (e.g. they do not cover all the following: scope, frequency and methodologies, responsibilities and requirements for conducting audits and reporting results.)	The audit program, including frequency is based on the EHS importance of the activity concerned and the results of previous audits. The audit procedures cover the scope of the audit, frequency and methodologies, required auditor competencies as well as the responsibilities associated with managing and conducting audits and reporting results.
American Refuel			2
CPS			2
Jamestown Electroplating		1	
Dresser Rand		1	
Anoplate		1	
Zotos			2
Magnetic Technologies		1	

Step 3: Scoring

Assigned Code	Respondent / Organization	Category 1	Category 2	Category 3	**Score for case 12**
A	American Refuel			2	**2**
B	CPS			2	**2**
C	Jamestown Electroplating		1		**1**
D	Dresser Rand		1		**1**
E	Anoplate		1		**1**
F	Zotos			2	**2**
G	Magnetic Technologies		1		**1**

Step 4: Interpretation of Results

Organizations A, B and F in addition to establishing procedures to conduct audits go through the entire gamete of requirements. The audit has a defined scope, frequency and methodology which, is followed. The auditor qualifications are evaluated to ensure effectiveness of the audit. The results of the audits are reported to all applicable like the employees and board of directors.

Step 5: Analysis

The process followed by A, B and F ensures that the audit is a serious process as the results are communicated to the management and employees. Therefore, any non-conformances that need to be fixed would get management support which is very essential. The employees on the other hand are held accountable to complete any corrective/preventive action initiated. This loops in the check part of the PDCA cycle which is the back bone of the EMS.

Step 6: Suggestion

All organizations need to establish an active program for assessing performance and preventing and detecting nonconformance with legal and other requirements of the EMS, including an establishment of a compliance audit program and an EMS audit program.

It is important for organizations to establish and maintain (a) program(s) and procedures for periodic EMS audits to be carried out, in order to determine whether or not the EMS: conforms to planned arrangements for environmental management including the requirements of ISO 14001; and has been properly implemented and maintained; and to provide information on the results of audits to management.

Audit program, including any schedule, should be based on the environmental importance of the activity concerned and results of previous audits. Audit procedures should be designed to cover the audit scope, frequency and methodologies, as well as the responsibilities and requirements for conducting audits and reporting results.

Procedure for scheduling audits:

1) The EHS staff could prepare an audit schedule. This schedule should be based on the importance of the environmental activities (aspect/impact analysis) and the results from previous audits. Those activities that have higher importance or more impacts on the environment and those activities that have had non-conformance problems in previous audits should be priorities in the scheduling of audits.
2) Each area within the EMS should be audited at least once a year. Areas to be audited include (but are not limited to):
    - EHS' EMS Procedures Manual against the ISO 14001 requirements,
    - EHS Program Areas with respect to EHS' EMS requirements

    These two types of audits may be completed in conjunction or separately. For example, an audit might be conducted to test the Environmental Services Program against EHS' EMS procedures for Emergency Preparedness and Response. At that same time, EHS' EMS procedures for Emergency

Preparedness and Response can also be audited for compliance with the requirements in clause 4.4.7 of ISO 14001. However, these two audits can be conducted separately as well.

3) The EHS staff could define the scope and objectives for each audit. The scope might include:
   - any procedures or standards to be considered,
   - what department or area is to be audited,
   - the type of the audit (compliance audit, EMS audit, management audit, etc.),
   - any follow-up on problems or non-conformances from previous audits,
   - any follow-up on corrective actions as a result of previous audits, and
   - any previous audits to be verified etc.

   The purpose of the scope is to tell the auditor in broad terms what they should be looking at.

4) The EHS staff could select a trained and qualified auditor(s) to conduct each audit. The following conditions are to be considered in the selection of auditors:
   - Training: The auditor must be familiar with ISO 14001, 14010, 14011, and 14012. The auditor is required to have attended some form of auditing training, either through an ISO 14000 workshop, by co-workers trained in ISO 14000 auditing, or by other equivalent means.
   - Attributes: The auditor should possess certain attributes as outlined in ISO 14010, 14011, and 14012.
   - The auditor should possess knowledge of the EMS implemented by EHS, including the procedures manual, records manual and any other resources used to run the system.
   - The auditor should be proficient in both written and verbal communication skills.
   - The auditor should have credibility within EHS.

5) The auditors usually are consultants. However, to maintain objectivity, Program Managers should not be allowed to audit their own programs.
6) The auditor chosen to perform a particular audit shall be responsible for notifying the auditee. This notification can take place through a formal document, a scheduled appointment, or some other acceptable form of communication. If possible, this notification should include a meeting time, tentative agenda, time frame, etc.
7) While conducting the audit, the auditor should utilize the Audit Report Form (or an equivalent documented and final report) to record the outcome of the audit. In addition, the Auditor Notes Form may be used to record any notes or other information during the audit, and as a checklist for standard audit practices.
8) Upon completion of the audit, the auditor (with the approval of the Director of EHS) determines any non-conformances. The auditor, or the Director of EHS, then issues non-conformance reports (via "WSU's EHS Service/Response Form") per procedures outlined in the organizations Non-conformance, Corrective and/or Preventive Action Procedures.
9) The auditor is responsible for completing the Audit Report Form (or an equivalent documented and final report) and for ensuring that this information is communicated to the EHS staff. This report should be maintained for future reference.

4.6 Management Review

Step 1

Case 13: Has the top management reviewed the EMS and what have they considered when reviewing the performance of the EMS?

Step 2

Findings:

A. AMERICAN REFUEL – The management does conduct an EMS assessment on an annual basis. There is no specific checklist in reviewing the EMS. The management considers the external audit reports and any regulatory issues in the past year for assessing the effectiveness of the EMS.

B. CPS- There is a half yearly management review of listed significant aspects/impacts. The external customer reports, the corrective action response (CAR), vendor performance and quality reports are used to assess the effectiveness of the EMS.

C. JAMESTOWN ELECTROPLATING – No information.

D. DRESSER RAND – The results of the various inspections and audits are graphically represented to the management on a monthly basis. The information highlights the areas of concern versus good performance. The management assess' the EMS annually with the help of these reports.

E. ANOPLATE - The management reviews all the elements of the EMS and incorporates necessary changes to the EMS accordingly.

F. ZOTOS - The safety committee reports to the management the results of their monthly meetings (a forum where the various audits and reviews are discussed to initiate any appropriate change). On an annual basis the management along with the safety committee reviews the EMS.

G. MAGENTIC TECHNOLOGIES- The management does involve itself on a monthly basis to review EHS performance through audits. However, the EMS is evaluated against the EHS performance annually.

TABLE 13: Categorization of findings:

Case 13: *Management Review of EMS*

Respondent	Category 1	Category 2	Category 3
	No arrangements exist to ensure that top management reviews the EMS to ensure continuing suitability, adequacy and effectiveness.	Top management has plans and arrangements to review the EMS to ensure continuing suitability, adequacy and effectiveness. Such reviews are not documented. There is no schedule for periodically reviewing the EMS. The management review process is not adequate to ensure that the necessary information is collected to allow it to carry out the evaluation.	Top management has reviewed the EMS to ensure continuing suitability, adequacy and effectiveness. As part of the review process, the necessary information is identified and collected to allow management to carry out this evaluation. Top management has determined the intervals at which it will review the EMS. Management's review is documented.
American Refuel		1	
CPS		1	
Jamestown Electroplating	0		
Dresser Rand		1	
Anoplate		1	

Zotos		1	
Magnetic Technologies		1	
Self Observation: Most SME's the EHS or quality personnel is often a part of the top management. Hence being involved in the whole process at all stages, they do not find the need to conduct a formal management review that gets documented.			

Step 3: Scoring

Assigned Code	Respondent / Organization	Category 1	Category 2	Category 3	**Score for case 13**
A	American Refuel		1		**1**
B	CPS		1		**1**
C	Jamestown Electroplating	0			**0**
D	Dresser Rand		1		**1**
E	Anoplate		1		**1**
F	Zotos		1		**1**
G	Magnetic Technologies		1		**1**

Step 4: Interpretation of Results

Most of the organizations, except for C, plan for management to review the EMS to ensure continuing suitability, adequacy and effectiveness. However, as the management does get involved due to limited staff in SME's, the review is not scheduled at a regular interval nor is it documented. The management staff usually reviews the EMS on whatever, data is available. There is no method established for the management representative to get informed on all aspects of the EMS.

Step 5: Analysis

Majority of owners/managers in SMEs seem to have very little understanding/awareness of environmental issues in a broad sense and EMS implementation in particular.

The most significant internal obstacles for SMEs are derived from the lack of knowledge. There are often no environmental specialists, responsible managers or environmental experts in most SMEs and sometimes they do not even know about the legal obligations, like in the case of C. Secondly, the lack of resources including people, time, and money is an important obstacle for SMEs. As a result documentation suffers and often non-conformances are attended to fix the problem in sight.

There fore, management review seems like a repetition especially when the management does not have enough data to look at trends to analyze the effectiveness of EMS.

Any management review that happens in the case of the other respondents seems to be due to the management representative's own enthusiasm.

Step 6: Suggestion

Management reviews of performance against established objectives and targets should e documented. Top management should, at intervals review the EMS, to ensure its continuing suitability, adequacy and the effectiveness of the EMS in meeting policy commitments.

Management review process should ensure that the necessary information is collected to allow management to carry out this evaluation. Management review should address the possible need for changes to policy, objectives and other elements of the EMS, in the light of EMS audit results, changing circumstances and the commitment to continual improvement.

Procedure for Management Review:

A. The EHS staff should be responsible for scheduling and conducting a minimum of one "EMS Management Review" meeting a year. It is the responsibility of the EHS staff to ensure that the necessary data and other information are collected prior to the meeting. This meeting must be conducted between the Department of EHS, the Top Management Representative, The line management representative and any other staff representative like legal affairs that may seem applicable.
    1. Progress at meeting objectives and targets
    2. Any changes to objectives and targets
    3. Any changes to Aspect list
    4. Summary results of internal audit and external audits conducted since the last "EMS Management Review" meeting
    5. Summary of the status of corrective and preventive actions
    6. Resource use and resource needs
    7. Summary of benefits of EMS system versus costs of the system

B. At a minimum, each "EMS Management Review" meeting should consider the following:
    1. The suitability, adequacy and effectiveness of the Environmental Policy
    2. The suitability, adequacy and effectiveness of the environmental objectives (as well as the organization’s current status against these objectives)
    3. The overall suitability, adequacy and effectiveness of the EMS
    4. The suitability, adequacy, and effectiveness of training efforts
    5. The results of action items from the previous "EMS Management Review" meeting
    6. Recommended changes to the EMS to ensure continual improvement

C. Output from the meeting:
    1. Meeting minutes and list of attendees
    2. Summary of key issues discussed

3. Summary of decisions including any: action plan changes to strategic plan, changes to procedures and policy, budget and resource reallocation, changes to objective and targets, and action items arising from the meeting
4. Feedback to faculty, staff, students and public: A copy of the meeting minutes should be distributed to attendees and any individuals assigned action items. A copy of the meeting minutes should also be retained on file as per the procedures outlined in the record keeping procedures.

4.6 Management Review

Step 1

Case 14: What were the expectations from the concept of continual improvement?

Step 2

Findings:

A. AMERICAN REFUEL – A method that would evaluate achievement versus targets and this review to help in setting future targets.

B. CPS- A method that would initiate a policy review whenever the established procedures fail to achieve the intended target.

C. JAMESTOWN ELECTROPLATING – A timely but quick process of comparing the results to the objectives set and incorporate the same in the decision-making process.

D. DRESSER RAND – An ongoing process that would incorporate monthly review of achievements and initiate necessary changes in the decision making process.

E. ANOPLATE - The organization strongly feels the need for a final annual review of all the reviews. This information could be used to for future decision making.

F. ZOTOS - The safety committee is also involved in the decision making process. There fore provision of first hand information would enable better decision making.

G. MAGENTIC TECHNOLOGIES- A system where the present actions are evaluated in light of future effects. For example inappropriate disposal of Universal Waste.

TABLE 14: Categorization of findings:

Case 14: *Continual Improvement Expectations*

Respondent	Category 1	Category 2	Category 3
	There are no expectations from the continual improvement process.	Management's review addresses the elements necessary for EMS implementation and the procedures associated with its implementation, but does not address possible needs to change the policy or its objectives and targets.	The management review addresses changing circumstances that might necessitate the possible needs for changes in policy, objectives and other elements of the EMS, in the light of EMS audit results, changing circumstances and the commitment to continual improvement.
American Refuel		1	
CPS		1	
Jamestown Electroplating		1	
Dresser Rand		1	
Anoplate		1	
Zotos		1	
Magnetic Technologies		1	

Step 3: Scoring

Assigned Code	Respondent / Organization	Category 1	Category 2	Category 3	**Score for case 14**
A	American Refuel		1		**1**
B	CPS		1		**1**
C	Jamestown Electroplating		1		**1**
D	Dresser Rand		1		**1**
E	Anoplate		1		**1**
F	Zotos		1		**1**
G	Magnetic Technologies		1		**1**

Step 4: Interpretation of Results

All the organizations seem to be aware of the concept of continual improvement. They perceive continual improvement efforts to address the elements necessary for EMS implementation and the change procedures associated with its implementation.

Step 5: Analysis

Most SME's understand that efforts towards continual improvement would mean ongoing partnership both with management and coordinators along with reinforcement, enhancement and upgrading of systems. This requires a lot of extra effort according to SME's and most SME's being at the beginning point of establishing an EMS haven't given continual improvement much thought.

For SME's, comparing products of competitors is still thought to be a frequent application of Life Cycle Analysis while in large organizations this use is seldom mentioned and the main issue is in product development, measuring the performance of planned alternatives against existing products.

Step 6: Suggestion

Continuous improvement creates steady growth and improvement. It does this by keeping a business focused on its goals and priorities. Although continuous improvement is steady, the sum of all the small improvements can cause a profound net effect greater than the sum of all the small improvements.

The following are some key points when looking at your continuous improvement plan:

1. Continuous means ongoing. The process never stops.
2. Once a year, the organization should have an outsider review the business. Outsiders can often see what the internal staff cannot. This could be a part of the EMS auditing conducted.
3. The simple and cheap things should be done first and quickly. This builds credibility, momentum and commitment with the staff. It also gives the organization practice.
4. A formal suggestions system for the employees should be established.
5. It is not a one step process, stages should be planned.
6. Prioritizing the work is important. Working on more than that can diffuse effort, energy and resources.
7. Positive reinforcement is very essential as it creates a positive environment for improvement, which employee participation.
8. Continuous improvement issues should be discussed in the organization's production and business meetings.
9. Customers should be involved while making improvements. Focus on delivering increasing value. This means getting regular feedback on how the business is performing and what customers want and need.
10. Look for breakthrough improvements. One of the added benefits of continuous improvement is: everything is on the table. Some small improvements can turn out to be major improvements. Often these breakthroughs are not known until

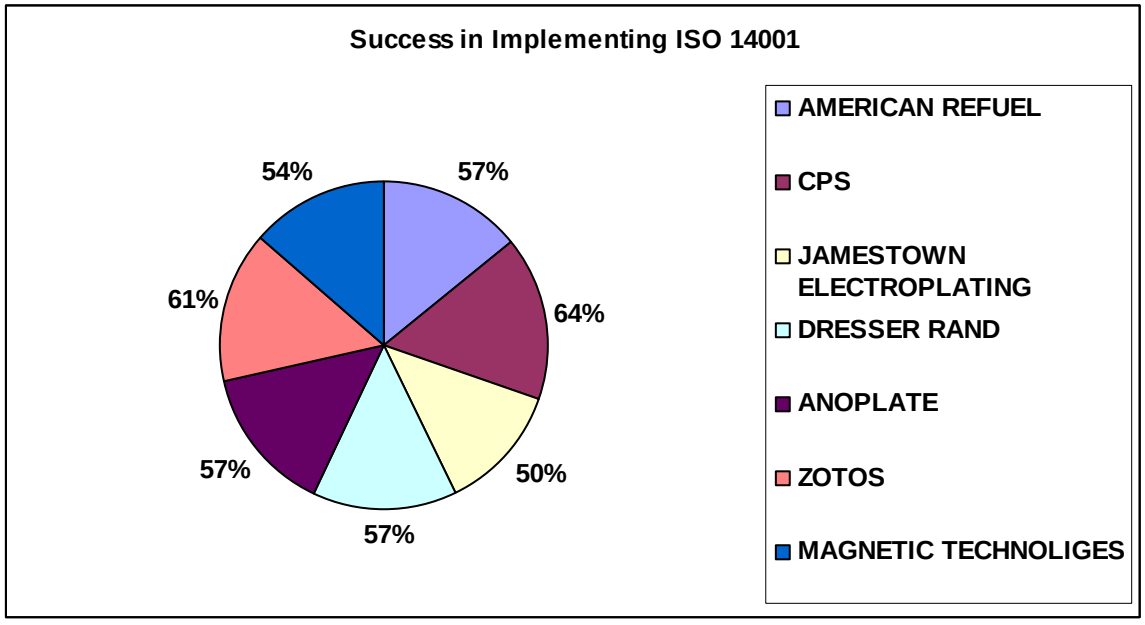
tried. Be aware breakthroughs exist and always look for them. This is a real benefit of using a continuous improvement process.

11. Develop a continuous improvement system that works for the business. Do not copy without trying – what works for one business may not work for another.
12. Look inside the industry for competition and best practices. Competitors can often show a better way. If it works, use it!
13. Use a cost-benefit analysis if you have difficulty setting priorities.
14. Look outside the industry to see what other industries are doing. It is likely to find more improvement ideas outside.
15. Encourage new ideas and ways to improve. Make this a part of the business culture.

Continuous improvement is a business philosophy that has proven results. The main idea behind continuous improvement is constant focus. By focusing on the business improvisations could be made on a continuous basis. It gives the organization a long-term competitive advantage.

Table 15: INTEGRATION OF SCORES

Case #	AMERICAN REFUEL	CPS	JAMESTOWN ELECTROPLATING	DRESSER RAND	ANOPLATE	ZOTOS	MAGNETIC TECHNOLIGES
Case 1	**1**	**2**	**1**	**1**	**1**	**2**	**1**
Case 2	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Case 3	**2**	**2**	**2**	**2**	**2**	**2**	**2**
Case 4	**1**	**2**	**1**	**2**	**2**	**1**	**1**
Case 5	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Case 6	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Case 7	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Case 8	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Case 9	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Case 10	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Case 11	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Case 12	**2**	**2**	**1**	**1**	**1**	**2**	**1**
Case 13	**1**	**1**	**0**	**1**	**1**	**1**	**1**
Case 14	**1**	**1**	**1**	**1**	**1**	**1**	**1**
FINAL SCORE (out of 28)	**16 (57%)**	**18 (64%)**	**14 (50%)**	**16 (57%)**	**16 (57%)**	**17 (61%)**	**15 (54%)**



CHAPTER 8

CONCLUSION

The graphical representation of the scores integrated from the findings of the respondents/organizations indicates that all the seven organizations express a gratification of only 57% (on an average) of establishing the verification systems, management review processes and concept of continual improvement.

Three tentative conclusions can be drawn from these findings. The first is that SMEs are likely only to undertake formal planning when faced with some major change or crisis. Some SMEs asked for outside help while the others may have developed their strategies in-house in a more structured way.

A second conclusion is that SMEs seem little different from larger corporations when it comes to the diversity of businesses they are in. The major distinction is that they are often unaware of the fact. Even where they are aware they still run the operation as if it were homogeneous. This is a mode of operation doe not favor proactive environmental management.

A third conclusion is that SMEs do not fully understand the markets they are in. This is reflected by their optimism, sometimes in the face of facts, about how quickly they can grow the business and about the amount of market they can grab from competitors. Another symptom of poor understanding comes from the discrepancies between their plans and what the market requires. Thus the danger is that the plans they do make may be unrealistic.

Also it is clear from the findings that the SMEs embarked on the exercise because they found it hard to do internally through time constraints and, often, lack of knowledge.

Therefore the following recommendations are made to SME's to overcome their problems with the standard. In the case of internal obstacles, SMEs should train selected employees so they can act as trainers for other employees. SMEs should consider the process of implementation and maintaining the EMS as an on-going process of prevention and improvement. Top management support and leadership, however is the most important factor to overcome internal obstacles.
In the case of external obstacles, the regulators should consider easing the regulatory pressure on SMEs implementing the standard. Ease of taxes could help SMEs tremendously.

SMEs should participate in seminars and training that could help develop a better understanding of the ISO 14001 standard. Tackle the implementation process in small portions. Locate an experienced and reliable consultant, who can act as an effective partner throughout the whole project. Approach a supplier, a customer or education institutions to find out if they could help.

CHAPTER 9

ANNEX I: GLOSSARY

ISO 14000: ISO 14000 is a series of international standards on environmental management. It provides a framework for the development of an environmental management system and the supporting audit program.

ISO 14001: ISO 14001 is the corner stone standard of the ISO 14000 series. It specifies a framework of control for an Environmental Management System against which an organization can be certified by a third party.

Other ISO14000 Series Standards: are actually guidelines, many to help you achieve registration to ISO 14001. These include the following:

ISO 14004 provides guidance on the development and implementation of environmental management systems

ISO 14010 provides general principles of environmental auditing (now superseded by ISO 19011)

ISO 14011 provides specific guidance on audit an environmental management system (now superseded by ISO 19011)

ISO 14012 provides guidance on qualification criteria for environmental auditors and lead auditors (now superseded by ISO 19011)

ISO 14013/5 provides audit program review and assessment material.

ISO 14020+ labeling issues

ISO 14030+ provides guidance on performance targets and monitoring within an Environmental Management System

ISO 14040+ covers life cycle issues

Of all these, ISO14001 is not only the most well known, but is the only ISO 14000 standard against which it is currently possible to be certified by an external certification authority.

EHS stands for Environmental Health and Safety

EMS: stands for Environmental Management System. The part of the overall management system that includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy.

SME: is the abbreviation of Small and Medium-sized Enterprises. The European Union Commission has adopted the definition of SMEs which provides a clear global framework for all the measures directed towards micro-, small and medium-sized enterprises. The adopted definition is as follows:

	Medium-sized	**Small**	**Micro-enterprise**
Max. number of employees	**Max 250**	**Max. 50**	**Max. 10**
Max. turnover (in million ECU)	**40**	**7**	**-**
Max. balance-sheet total (in million ECU)	**27**	**5**	**-**

The International Business Food Chain: Food chain - In the ecological context refers to a community of organisms where each member is eaten in turn by another member in order to survive. In the business context the food chain is referring to the supply chain which is the network of retailers, distributors, transporters, storage facilities and suppliers that participate in the sale, delivery and production of a particular product.

Audit criteria: Policies, practices, procedures or requirements against which the auditor compares collected audit evidence about the subject matter.

Note: Requirements may include, but are not limited to, standards, guidelines, specified organizational requirements and legislative or regulatory requirements.

Audit finding: Result of the evaluation of the collected audit evidence compared against the agreed audit criteria

Note: The findings provide the basis for the audit report.

Audit team: Group of auditors, or a single auditor, designated to perform a given audit.

Note: The audit team may also include technical experts and auditors-in-training. One of the auditors on the audit team performs the function of lead auditor.

Auditee: is the organization to be audited or being audited**.**

Continual improvement: Process of enhancing the environmental management system to achieve improvements in overall environmental performance in line with the organization's environmental policy.

Note: The process need not take place in all areas of activity simultaneously.

Environment: Surroundings in which an organization operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelations. In this study it also applies to the internal environment which is the workplace.

Environmental Aspect: Element of an organization's activities, products or services that can interact with the environment.

Note: A significant environmental aspect is an environmental aspect that has or can have a significant environmental impact.

Environmental Audit: is a systematic, documented verification process of objectively obtaining and evaluating audit evidence to determine whether specified environmental activities, events, conditions, management systems, or information about these matters conform with audit criteria (1.2), and communicating the results of this process to the client.

Environmental auditor: Person qualified to perform environmental audits.

Environmental impact: Any change to the environment (internal or external to the organization), whether adverse or beneficial, wholly or partially resulting from an organization's activities, products or services.

Environmental management system audit: Systematic and documented verification process of objectively obtaining and evaluating audit evidence to determine whether an organization's environmental management system conforms to the environmental management system audit criteria, and communicating the results of this process to the client.

Environmental objective: Overall environmental goal, arising from the environmental policy, that an organization sets itself to achieve, and which is quantified where practicable.

Environmental performance: means measurable results of the environmental management system, related to an organization's control of its environmental aspects, based on its environmental policy, objectives and targets.

Environmental policy: Statement by the organization of its intentions and principles in relation to its overall environmental performance which provides a framework for action and for the setting of its environmental objectives and target.

Environmental target: Detailed performance requirement, quantified where practicable, applicable to the organization or parts thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.

Organization: Company, corporation, firm, enterprise, authority or institution, or part or combination thereof, whether incorporated or not, public or private, that has its own functions and administration.

Note: For organizations with more than one operating unit, a single operating unit may be defined as a organization

ANNEX II: INTERVIEW GUIDE

Interview Guide

For checking and corrective action management review and continual improvement

Measurement and Evaluation

1. Is there a procedure to identify the environmental aspects of your business over which you have control or influence and to determine actual or potential significant impacts on the environment?
   - Are aspects related to these significant impacts considered in setting environmental objectives?
   - Have EHS performance indicators been identified for every significant environmental aspect?
   - Have levels of acceptable/unacceptable EHS performance been identified for each indicator?
2. How is monitoring and measuring of key characteristics of the operations that can have significant environmental impact done?
   - Do procedures exist for the same?
   - Is there a process to check whether calibration and maintenance of monitoring equipment is done?
   - Is there an established personnel responsible for maintaining these procedures?
3. Are there established documents that ensure periodic evaluation of compliance with applicable EHS legislation, regulations and permits?

Non-conformance and Corrective and Preventive Action

4. How is responsibility for addressing non-conformances defined and communicated?
   - How are non-conformances brought to the attention of the responsible person - who to notify/contact?
   - What resources – human, financial, technology, operational are available and where/how to acquire them?

5. How is corrective/preventive action?
   - Determined – the basis
   - Recorded – the process
   - Implemented– the process and describe your role in how it supports the implementation of EMS.
   - Documented – the process and whether a person is designated
6. Does you a system to evaluate the appropriateness of corrective or preventive action, by reviewing causes, trends and patterns, and environmental impacts of nonconformance?
7. Does the organization provide for prioritization and for the information needed to ensure corrective and preventive action is commensurate with the actual / potential EHS impacts determined by the organization?

Records

8. Does your organization have procedures for the identification, maintenance and disposition of environmental records been established and maintained?

9. Do the EHS records include training records, results of audits / reviews, corrective and preventive actions, information on responsibilities in the EHS area of activities?

10. Are the records legible, identifiable and traceable through sampling records?

11. Are the EHS records stored in such a way as to be readily retrievable and protected against damage, deterioration or loss?

Audits

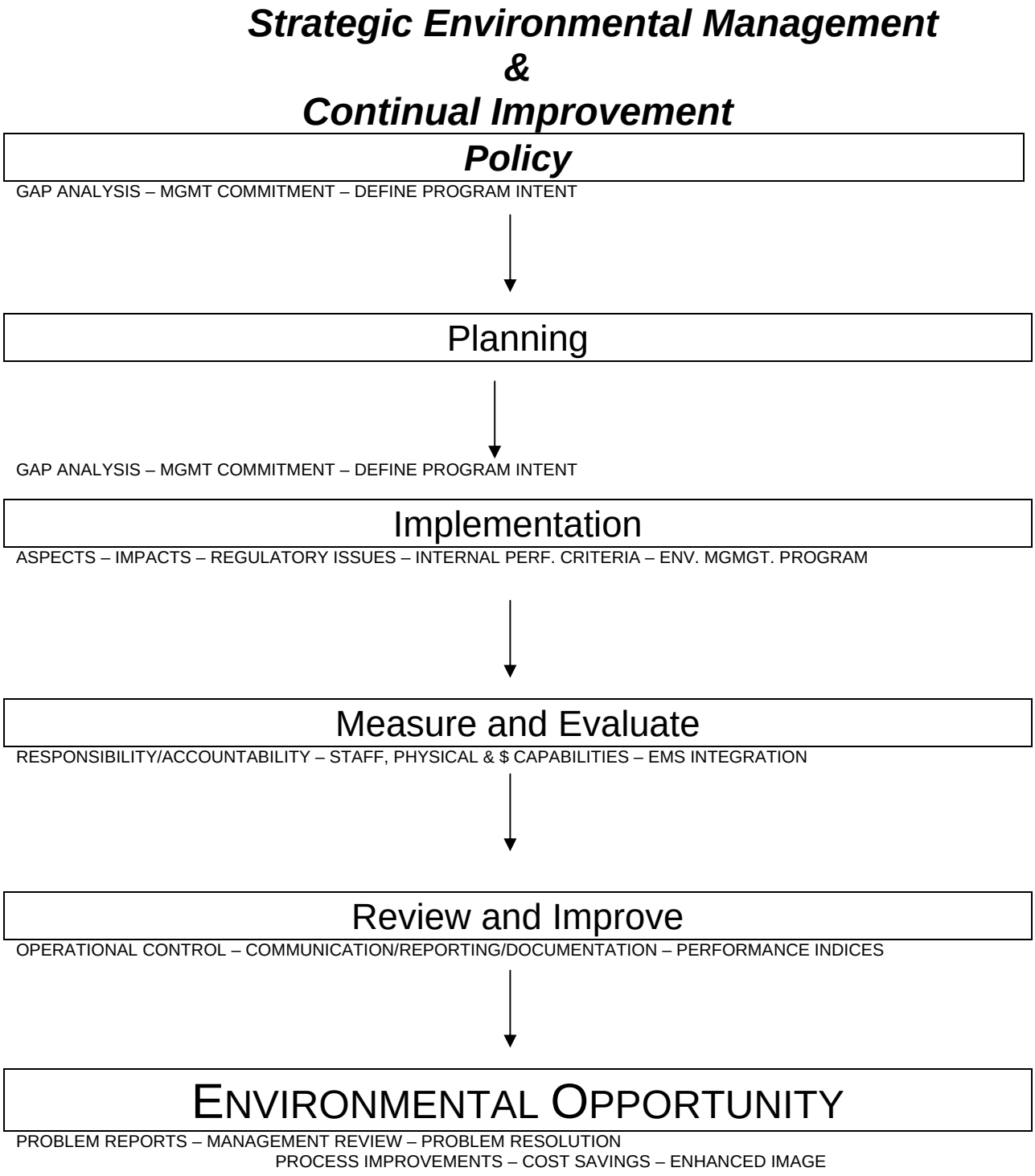
12. Does the organization have (a) program (s) and procedures for periodic environmental management system audits?

Management Review

13. How does management obtain information concerning
- emerging environmental issues
- regulatory developments
- activities and effectiveness of environmental personnel
- nature and adequacy of non human resources
- EHS expenditure and savings
- Individual accidents, incidents
- Concerns of key internal / external parties

14. What were the expectations from the concept of continual improvement?

ANNEX III: PROCESS OF ESTABLISHING AN ENVIRONMENTAL MANAGEMENT SYSTEM



ANNEX IV: PROCESS OF ESTABLISHING AN ENVIRONMENTAL MANAGEMENT SYSTEM

The EMS Process

EMS – procedures; instructions; documents

4.5: Management Reviews

4.4.4: System Audits

4.4.3: Management Records

4.4.2: Non-Compliance

4.4.1: Monitoring & Measuring

4.3.6: Operational Control

4.3.5: Document Control

4.3.4: Manual & Documentation

4.3.2: Training & Awareness

4.3.1: Structure & Responsibility

4.2..4: Environmental Program

4.2.3: Targets & Objectives

4.2.2: Legal Requirement

4.2.1: Environmental Aspects

4.1 Environmental Policy

INITIAL REVIEW GAP ANALYSIS – MANAGEMENT COMMITMENT

REFERENCE

[1] European Commission (2003-05-06), Recommendation 2003/361/EC: *SME Definition (http://europa.eu.int/comm/enterprise/enterprise_policy/sme_definition/index_en.htm).* Retrieved on 2007-05-24

[2] Rutledge, Louis. © Copyright 2000-2006 MasterControl: *ISO 14000*

ENVIRONMENTAL MANAGEMENT STANDARDS TO MEET ENVIRONMENTAL QUALITY CHALLENGES AND REGULATIONS (HTTP://MASTERCONTROL.COM/REGULATIONS/ISO1400.HTML)

[3] Sasseville, Dennis R; Wilson, Gary W and Lawson, Robert; [1997] *ISO 14000 Answer Book , Environmental Management for the World Market*; Pages 58 & 59; New York, John Wiley & Sons, Inc.

[4] Ford Sustainability Report (2004/5) o Copyright; *"Managing Environmental Performance" ; (http://www.ford.com/en/company/about/sustainability/report/envManaging.htm)*

[5] Business & Society, Volume 45 Number 3, September 2006 354-381, *"Why Firms Mandate ISO 1400?" (http://bas.sagepub.com);* © 2006 Sage Publications , 10.1177/0007650306289387;

[6] Heinz-Werner Engel; © INEM - International Network for Environmental Management (2/1996*) "Environmental Performance Indicators and Benchmarking"; (http://www.inem.org/default.asp?ShowASK=ON&ID=5912&Menue=182)*

[7] From the Federal Register Online via GPO Access; "*EPA Position Statement on Environmental Management Systems and ISO 14001 and a Request for Comments on the Nature of the Data To Be Collected From Environmental Management System/ISO 14001 Pilots"* [Federal Register: March 12, 1998 (Volume 63, Number 48)] [Notices][Page 12094-12097] wais.access.gpo.gov [DOCID:fr12mr98-64] (*http://www.epa.gov/fedrgstr/EPA-GENERAL/1998/March/Day-12/g6389.htm)*

[8] Cascio, Joseph and Hale, Gregory J (May 1, 1996); *"ISO 14000: A Status Report"*; Copyright 1998 QCI International; (*http://www.qualitydigest.com/feb98/html/iso14000.html*)

[9] Keene, Michelle L.; September 1999; © The World Bank Environment Department and the Urban Industry and Energy Management Team; *"Developing a Culture of Industrial Environmental Compliance: A New Approach"; Pages 19-26; (http://info.worldbank.org/etools/docs/library/36654/developculture.pdf)*

[10] Goodman, Sally L., *"Is ISO 14001 an Important Element in BUSINESS SURVIVAL?"* The Quality Magazine of Australia, (June 1988)

[11] *"Voluntary Environmental Management Systems/ISO 14000"; (* August 21st, 2006); (http://www.epa.gov/owm/iso14001/isofaq.htm)

[12] Roig, Randy and Saponara, Anthony *"ISO 14001 Environmental Management Systems: A Complete Implementation Guide"* Environmental Business Information, 2003.

[13] Nigel O. Grace, Donna M. Grace, Albert L. Perez, and Nicole A. Maywah; Federal Facilities Enforcement Office of the U.S. Environmental Protection Agency and Office of Environmental Policy and Assistance of the U.S. Department of Energy (1998) "*Environmental Management Systems Primer for Federal Facilities*.." Page. 1.

[14] Baxter, Martin– (July-August 2004); ISO Management Systems Special Report – *"Taking the First Steps in Environmental Management*", Page 13 (*http://www.iso.org/iso/en/iso9000-14000/pdf/IMS0404-environment.pdf* **)**

[15] Turkow, David, *"A Guide for Initiating an Environmental Management System in Academia";* Rochester Institute of Technology Thesis Proposal, May 8, 2001.

[16] Roig, Randy and Saponara, Anthony "*ISO 14001 Environmental Management Systems: A Complete Implementation Guide*" Environmental Business Information, 2003.

[17] Goodman, Sally L., "*Is ISO 14001 an Important Element in BUSINESS SURVIVAL?*" The Quality Magazine of Australia, (June 1988).

[18] Silverman, Lori L., "*The Future of Quality in Organizational Performance*" ASQ Pages 106-118, Quality Press - March 1999

[19] Hillary, Ruth, *"Network for Environmental Management and Auditing*", Submitted to Department of Trade and Industry, Environment Directorate © Crown 1999

[20] EMAS Toolkit for small organizations. © Copyright European Communities, (1995-2007*) "How to control and monitor environmental performance"; (http://ec.europa.eu/environment/emas/toolkit/toolkit_15.htm)*

[21] Dr. Gino Bianchi, *"CURRENT TRENDS IN ENVIRONMENTAL REGULATIONS AND ENFORCEMENT IN LATIN AMERICA"* (*http://www.geomatrix.com/latinamerica/course.html*)

[22] Dennis Jones, Paul Cooke and Karen James; *"GROUNDWORK WALES ACHIEVES ISO 14001" (2003); (http://www.groundworkwales.org.uk/iso14001.htm)*

[23] Jensen; © INEM - International Network for Environmental Management (2/1996) "*Environmental Assessments of Sites and Organizations";* *(http://www.inem.org/htdocs/inem_info.htm)*

[24] Xerox Corporation, 1999; "*Environment, Health and Safety Progress Report";* *(http://www.xerox.com/downloads/usa/en/1/1999ehsprog.pdf.*)

[25] Mexico Department and the Environmentally and Socially Sustainable Development Sector Management Unit, Latin America and the Caribbean Regional Office, Report No. 18071-ME, September 8, 1998 (*http://www.worldbank.org/nipr/work_paper/guada/htm)*

[26] Bartel, Constantine O. & Oyarzun-Reyes, Diego; *"Managing the Environment Across Boarders"* Chapter II. Pages 14-23; 2002, United Nations Publications

[27] Bartel, Constantine O. & Oyarzun-Reyes, Diego; *"Managing the Environment Across Boarders"* Chapter II. Pages 23-28; 2002, United Nations Publications

[28] Bartel, Constantine O. & Oyarzun-Reyes, Diego; *"Managing the Environment Across Boarders"* Chapter II. Pages 28-38; 2002, United Nations Publications

[29] Hillary, Ruth, "*Network for Environmental Management and Auditing*", Submitted to Department of Trade and Industry, Environment Directorate © Crown 1999

[30] Adapted with permission from Morelli, John, "*ISO14000: A CATALYST FOR REINVENTING EPA*", doctoral dissertation. UMI, 1997.

[31] Lindlof, Thomas R.,"*Qualitative Communication Research Methods"*, pg. 127-128, SAGE, 1995.

[32] Lofland, John and Lyn H. Lofland, "*Analyzing Social Settings"*, pg. 186, SAGE, 1995

[33] Lofland, John and Lyn H. Lofland, "*Analyzing Social Settings"*, pg. 187-188, SAGE, 1995

[34] Glaser, Barney G. and Anselm L. Strauss, "*The Discovery of Grounded Theory: Strategies for Qualitative Research"*, pg. 105-115, Aldine, 1967.

[35] Lindlof, Thomas R., "*Qualitative Communication Research Methods"*, pg. 237, SAGE, 1995.

[36] Silverman, David, "*Interpreting Qualitative Data"*, pg. 145-149, SAGE, 1994.

[37] Patton, M.Q., *"Depth Interviewing," How to Use Qualitative Methods in Evaluation"*, pg. 113, SAGE, 1987.

[38] Patton, M.Q., "Depth Interviewing," *How to Use Qualitative Methods in Evaluation*", pg. 120, SAGE, 19

[39] Lindlof, Thomas R*., "Qualitative Communication Research Methods"*, pg. 238-242, SAGE, 1995

[40] Silverman, David, "*Interpreting Qualitative Data"*, pg. 156-188, SAGE, 1994.

[41] Silverman, David, "*Interpreting Qualitative Data"*, pg. 161, SAGE, 1994

[42] Glaser, Barney G. and Anselm L. Strauss, "*The Discovery of Grounded Theory: Strategies for Social Research*", pg. 104, Aldine, 1967.