The Role of ISO 14001 in Environmental Management at U.S. Manufacturing Facilities
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Introduction

Environmental management has evolved over the past four decades. At first, businesses responded to new regulations as they were enacted. These regulations generally addressed pollution by separate environmental media, such as water or air. This type of regulation, where government dictated the actions to be taken, was often perceived by business as being overly restrictive, inefficient, and costly. In response, many businesses began to seek more proactive ways of effectively managing their environmental impacts.

One of the most widely used voluntary environmental initiatives is the ISO 14001 environmental management standard. ISO 14001 is an international environmental management standard that offers a systematic approach to compliance and continual improvement while being flexible and widely applicable to a variety of organizations, such as manufacturers, service providers, and government agencies. Despite these advantages, ISO 14001 has not gained complete approval in the United States. It could be argued that its flexibility and lack of performance requirements make it ineffective, while others question if it adequately addresses the management of environmental impacts.

This study explored the relationship between environmental management practices and ISO 14001 certification by comparing ISO 14001 certified facilities (ISO group) with a control group of non-ISO 14001 certified facilities (non-ISO group) to see if there were differences in their environmental management practices. Additionally, this study will determine if there is a difference over time between the ISO group and the non-ISO group in the chemical toxicity of releases and the chemical management practices.

This study found that facilities with ISO 14001 certification differ in the implementation of some environmental practices from facilities without certification. In particular, facilities with certification tended to have a stronger tendency toward integration and empowerment of facility managers and employees. This study also found that there was no difference over time in the chemical toxicity of releases or the chemical management practices between the ISO group and the non-ISO group.

Background

Facilities can manage their environmental impacts in different ways, one of which is to implement an environmental management system (EMSs). Benefits of an EMS can include:

- direct savings from increased efficiency, reductions in waste disposal and energy costs,
- indirect savings from improved corporate image, and
- avoided costs such as fines, legal costs, insurance premiums and cleanup costs (1).

Figure 1. Model of an EMS

There are a variety of EMS standards that utilize a systems-based approach as shown in Figure 1. ISO 14001 is one such standard that is being quickly adopted by many companies around the world. As of 2000, there were 22,897 organizations in 98 countries with EMSs certified under ISO 14001.² It is also the most common EMS standard used in the United States. By the end of 2001, there have been 36,756 ISO 14001 certificates issued in 112 countries (2).

¹ Advisors: Magali Delmas, James Frew, Catherine Ramus

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States. An organization may choose to obtain ISO 14001 certification of its EMS to comply with a business partner’s request, to gain access to markets or capital, or as a public demonstration of environmental stewardship (3).

ISO 14001 was developed by the International Organization for Standardization to provide a template for environmental management systems. In order for facilities to obtain ISO certification they must:

- Develop a policy statement on the organization’s commitment to the environment.
- Identify the environmental impacts of products, activities and services.
- Make a commitment to compliance with applicable laws and regulations.
- Set environmental goals for the organization, and developing the means to achieve them
- Establish roles and environmental responsibilities within the organization.
- Maintain documents about the EMS and related procedures.
- Monitor key activities and track EMS performance to correct problems and prevent reoccurrences.
- Audit the EMS to verify that it is effective and achieving objectives and targets to ensure that it is still suitable and appropriate.
- Make a commitment to continual improvement of the EMS. (4)

Despite these requirements, ISO 14001 does not mandate a set level of environmental performance nor does the standard require the use of a particular technology.

There are a variety of ways to measure environmental performance. One such method that is commonly used is the EPA’s Toxic Release Inventory (TRI). A facility is required to report if it manufactured or processed more than 25,000 pounds or otherwise used more than 10,000 pounds of any listed chemicals. Researchers commonly use this database because it is publicly available for 28,000 facilities and it provides thirteen years of release data.

**Methodology**

This report compares facilities with ISO 14001 certified environmental management systems (ISO group) with facilities that do not have an ISO 14001 certified environmental management system (non-ISO group).

The population selected for study included manufacturing facilities that reported to the TRI in 2000 and fell within the Standard Industry Classification codes3 2000 to 3999. A total of 484 facilities were selected to participate in this study. Half of these (242) had EMSs certified to the ISO 14001 standard prior to the year 2000. The other half were not certified and were selected at random from the remaining firms in the 2000 TRI as a control group.

**Figure 2. Graphic Representation of Population**

The environmental management analysis measured the implementation of environmental management practices based on responses to a survey. This survey was sent to facility environmental managers and responses were analyzed to determine if there were differences between the groups.

**Environmental Management Hypothesis**

Facilities with an ISO 14001 certified EMS have more comprehensive environmental management practices than facilities with a non-certified EMS.

The survey questions were categorized into eight elements that were found to be common throughout environmental management literature. These elements were used to assess the comprehensive nature of environmental management for each group. The eight elements are:

- Environmental Policy
- Management Involvement
- Employee Participation
- Training
- Target Setting
- Monitoring
- Auditing
- Reporting

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3 The Standard Industrial Classification (SIC) code is a four-digit industry identifier, the first two digits of which organize industry into general categories.
The Role of ISO 14001

The second analysis assessed the difference between the chemical releases reported to the TRI by the two groups. This chemical release analysis measured the change in total toxicity and chemical management practices over several time periods in order to provide a picture of the reduction in releases before and after ISO 14001 certification. Releases where normalized for differences in toxicity and changes in production level.

**Chemical Release Hypothesis**
Facilities with an ISO 14001 certified EMS have greater decreases over time in toxic emissions than facilities with a non-certified EMS.

**Results and Discussion**

A total of 193 facilities responded to the survey, a response rate of 40%. One hundred and twenty-six returned surveys were from facilities certified to the ISO 14001 standard and 67 were not certified to the standard. The number of employees at facilities in the ISO group had a median value of 450, while the non-ISO group was generally smaller at 127 employees.

Several similarities between the groups were discovered during the analysis. Employees of ISO and non-ISO groups receive a similar number of hours of environmental training. In addition, of those facilities that use environmental performance indicators, the ISO group was no more likely than the non-ISO group to monitor the use of hazardous chemicals or the air emissions.

Analysis of the data collected revealed significant differences in environmental management between the ISO and non-ISO group. Facilities in the ISO group were more likely to have more comprehensive implementation of the following elements: environmental policy, management involvement, employee participation, and training.

**Environmental Policy**

The ISO group was more likely to have an environmental policy and that policy was more likely to extend to the facility’s products and suppliers. In addition the ISO group provided employees with more avenues to learn about the environmental policy (Figure 3). This may allow for facilities with an ISO certified EMS to teach more individuals within a facility about the environmental policy and consequently the goals of the facility to minimize environmental impacts.

**Management Involvement**

The ISO Group had relatively more facility management involvement and less corporate management involvement than the non-ISO group in the review of their EMS. The ISO group was more likely to have their facility manager involved in the review (Figure 4). This may be due to the ISO group facilities being larger in size and therefore having more resources available at the facility level.

Survey respondents were given the opportunity to provide additional comments at the end of the survey. The following comments present a variety of views on ISO 14001 and environmental management that encompass the entire range of opinions, from positive to negative:

- An environmental management system, even in its most basic form, is critical to sustained environmental protection and regulatory compliance. What gets documented and measured gets managed.
- ISO 14001 has been beneficial and produced cost savings.
- One of the greatest strengths of ISO 14001 is that every employee at the plant plays a role in the success of the EMS.
- ISO 14001 is a good program but it generates work and paper more than expected and it’s trivial in some issues. Each auditor has his own interpretation of the standard.
- Certification was allowed to expire as a cost cutting measure. Regulatory issues have received priority over the EMS since that time.
- ISO 14001 is a total waste of time, no doubt created by bureaucrats. Voluntary environmental initiatives are smoke screens for big companies that have the time to fill. The management process becomes the work.
Employee Participation

The ISO group involved employees in facility environmental management more than the non-ISO group respondents. Not only was the ISO group more likely to have an employee suggestion system in place, but they also were more likely to include non-management employees in the review of their EMS and in environmental audits (Figure 5).

Training

The ISO group has more formalized training in that they are more likely to utilize procedures manuals, newsletters, posters and notices and written materials to communicate environmental issues to employees. In contrast, the non-ISO group was more likely to communicate these issues to employees through informal conversations with supervisors.

Integration and Empowerment

An interesting trend is revealed when the significant results of the environmental management analysis are interpreted in aggregate. In general, the environmental management practices in the ISO group permeated all levels within the facility and show a stronger tendency toward integration and empowerment of facility managers and employees.

This tendency had two dimensions; (1) facility managers participated in developing their facility’s specific environmental practices; (2) non-management employees were included in the management decision-making processes.

People directly involved in the daily operations of a facility may be better suited to create an environmental management system that more effectively addresses the impacts of those operations. The enhanced integration and empowerment at ISO group facilities may result in more effective environmental practices because facility managers and non-management employees have a greater sense of ownership of the EMS.

Chemical Releases

No significant difference in the reduction the chemical toxicity over time between the ISO group and the non-ISO group was found. Additionally, there is no difference in chemical management practices over time. While this analysis didn’t show a significant difference between the ISO group and the non-ISO group, toxic releases are only one of many impacts that may be managed using ISO 14001. These other impacts are significant and include activities such as, but not limited to; recycling, improvements in energy efficiency, reduced water use and source reduction of nontoxic raw materials.

Conclusion

Results of the environmental manager’s survey suggest that there are differences in the environmental practices of ISO 14001 and non-ISO 14001 certified facilities. However, these differences do not translate into a greater reduction of chemical releases in US manufacturing facilities. The high level of existing regulation associated with these industries and the public nature of TRI data may motivate both groups equally to reduce emissions. Future research should explore if non-regulated issues, such as water and energy use, are impacted by ISO 14001 certification.

References