

ISO 14001 Environmental Management Systems: a snapshot of the experience of solid waste organizations

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The following article summarizes the background to the development of the premier voluntary standard for the implementation and maintenance of an environmental management system (EMS), ISO 14001, and summarizes the experiences of four organizations working in the solid waste industry that have ISO 14001 EMS systems in place.

Introduction

In 1996, the International Organization for Standardization, known as "ISO" (after the Greek word *isos* for equal), promulgated the international voluntary standard ISO 14001:1996, "Environmental management systems – Specification with guidance for use." In 2004 the standard was revised by ISO and republished under the title "Environmental management systems – Requirements with guidance for use." ISO 14001:2004 is accompanied by a variety of supporting guidance documents with other numerical designations within the ISO 14000 group.

ISO 14001:2004 is the result of a collaborative international effort to address environmental challenges and trade-related environmental issues on an international basis. The primary objective of the standard is to provide a process-oriented approach to environmental management that allows organizations everywhere, regardless of their particular business, to systematically:

- Improve their environmental performance and prevention of pollution.
- Maintain compliance with relevant environmental regulations.
- Identify and prevent potential environmental problems before they occur.
- Identify and correct existing environmental problems.

Since promulgation of ISO 14001 in 1996, organizations worldwide have been using the standard as a guide to implementing their environmental management systems (EMSs) at their facilities. It is this standard that facilities can be audited against (and certified by a third-party registrar, if desired) to be in conformance with a systematic EMS process. Facilities which have implemented an ISO 14001 EMS are now accruing the benefits of their EMSs.

Several solid waste organizations around the U.S. have implemented ISO 14001 EMS systems. Four of these are addressed in this article including three governmental and one private

organization. They include: Kent County, Michigan, Department of Public Works; King County, Washington, Solid Waste Division; Southeastern Public Service Authority, Chesapeake, Virginia; and Waste Management, Houston, Texas.

ISO 14000 Series of Standards

The ISO 14000 series of standards includes ISO 14001 and numerous other "standards" documents which provide guidance and additional assistance in developing and maintaining an EMS and/or its components. ISO 14001 is the foundation of the ISO 14000 series and contains the requirements that may be objectively audited for EMS conformance. No other standard in the series contains *requirements* for an EMS. All other ISO 14000 standards are guidance documents and these can be divided into four categories including:

- Guidance for use of the ISO 14001 standard.
- Guidance for environmental labeling.
- Guidance for life-cycle assessment.
- Guidance for environmental performance evaluation.

Additional information about the ISO 14000 series of standards can be found at www.iso.org.

THE EMS Standard – ISO 14001:2004

ISO 14001:2004 is a *voluntary* international standard for environmental management. It is based on the philosophy of conformance to a management system to attain environmental improvement. ISO 14001:2004 consists of four clauses (main sections of text) and two annexes. Clauses 1 through 3 of the standard provide the introduction, references, and definitions. Clause 4 of the standard provides the specifications for an EMS to conform to ISO 14001:2004 and is a few pages long (a 20-minute read). The annexes contain guidance for use of the standard and the relationship of ISO 14001:2004 to ISO 9001:2000 (ISO Quality Management System Standard).

The ISO 14001:2004 standard provides a procedure for any organization to develop and maintain an EMS. The procedure includes 18 elements of activity:

- Establishment of the EMS scope.
- Environmental policy.
- Environmental aspects and impacts.
- Legal and other requirements.
- Environmental objectives, targets and programs.
- Resources and responsibility.

- Competence and training.
- Communication.
- Documentation.
- Control of documents.
- Operational control.
- Emergency preparedness/response.
- Monitoring and measurement.
- Evaluation of compliance.
- Corrective and preventive actions.
- Control of records.
- Internal auditing.
- Management review.

In summary, the standard provides for (at a particular facility) setting the scope of the EMS boundaries (e.g., geographic limits and functional areas of the business) and establishment of an environmental policy for a facility, followed by development of the potential ways the facility might interact with the environment (environmental aspects), and identification of the type and severity of the interactions (impacts) which are anticipated. Legal and other (e.g., internal) requirements are identified, and then objectives and targets are established to address the aspects and impacts. Environmental programs are then established to meet the objectives and targets and fulfill the intent of the environmental policy. The personnel responsible for implementation and maintenance of the EMS are identified and training and communication requirements are established. Selected documentation is developed and maintained and operational controls are established along with methods for handling emergency preparedness and response. Monitoring routines are developed and corrective and preventive action procedures are established to handle out-of-conformance and/or out-of-compliance (specific to legal requirements) events. Record-keeping procedures are established (historical documents), auditing of the EMS system is initiated and maintained (typically semi-annually), and management review is performed (typically annually).

The annual management review compares EMS performance against the environmental policy. Following any necessary and appropriate adjustments to the EMS system (and possibly to the policy), the cycle summarized above starts again. The intent of the EMS is to continually improve the environmental performance of the facility for which it is developed.

Interviews of Four Solid Waste Organizations

The authors interviewed four representative organizations working in the solid waste industry that are operating one or more facilities under an ISO 14001 EMS (whether or not certification is held). Both governmental and private organizations were interviewed to obtain comments on their experiences that would be helpful to municipal public works and private solid waste organizations considering implementing an ISO 14001-based EMS. The questions addressed to the organizations covered such issues as facility characteristics, reasons for implementing an EMS, registrar information, personnel response, costs, benefits, regulatory

involvement, and expert assistance. In addition to the interviews, we obtained supporting information about the organizations from their websites and other publicly available information. The results of the interviews are briefly summarized in Table 1 which can be found at http://www.scsengineers.com/Papers/APWA_Table_1_Jan08.pdf.

Kent County, Michigan, Department of Public Works

Implementation of the ISO 14001 EMS at the South Kent Landfill was a result of the interest of the Director of Public Works of Kent County to improve the environmental performance of the solid waste operations of the County. The ISO 14001 standard was chosen as the model to implement an EMS at the County landfill.

Mr. Ron Landis, Director of Engineering Services and Ms. Molly Sherwood, Environmental Compliance Manager, of Kent County Public Works provided the history and status of Kent County's implementation of an ISO 14001 EMS for the South Kent County Landfill (see aerial photo below). The landfill is an ash monofill facility that receives approximately 550 tons per day of municipal solid waste and 42,000 tons per year of ash.



Aerial photo of the South Kent County Landfill

Twenty-five personnel work at the landfill whose functional areas considered in the EMS include:

- Scale house
- Tipping face
- Throw off area
- Closed landfill areas
- Ash tipping face
- Operation and maintenance building
- Storage

The ash disposed at the landfill comes from an associated waste-to-energy (WTE) facility that is not included in the scope of the landfill's EMS.

The EMS implementation effort was begun in February 2006 and two consultants were used for support services. One consultant provided awareness training and assistance in implementation and a second provided internal auditor training. The County reports that their expenses including consulting fees amounted to approximately \$25,000. In addition, significant County staff time was expended for the EMS implementation. The Environmental Compliance

Manager was the lead for implementation and reported that she spent 10 to 20 hours per week for a year to implement the EMS. She reported that a staff technician invested the same time and several other staff invested 10 to 40 hours during the year as well. Based on her comments, it appears the County expended somewhat more than 200 work days of labor (essentially a work year) by one mid-level person for the EMS implementation.

The landfill identified 74 environmental aspects, with 19 considered significant. These significant aspects occurred in seven categories:

- Earthwork
- Mobile equipment
- Waste screening
- Tipping face
- Methane
- Ash
- Spills

There was little regulatory involvement in the EMS implementation effort; and while local regulators were positive about the EMS, they were not overwhelmingly so. This may have been related to the fact that the landfill has always maintained environmental compliance and a good working relationship with the regulatory community.

The implementation and certification by a third-party registrar (BSI America) was completed in approximately one year and the landfill's ISO 14001 EMS was certified on March 15, 2007. The County reported that the major challenges of implementing and maintaining its EMS are motivating the staff, maintaining environmental records, keeping up with the EMS paperwork, and finding time to complete corrective actions. Although there was some initial challenge regarding motivating the landfill staff, one particularly gratifying result was the teamwork that developed as implementation proceeded.

The County reports that their EMS is still early in its maturation and significant benefits have yet to accrue. However, they have found that their EMS has resulted in better record keeping and documentation, improved the focus on environmental issues, and allowed the landfill to improve its tracking of energy use and wastes disposed at the landfill.

King County, Washington, Solid Waste Division

Implementation of an ISO 14001 EMS for the King County Solid Waste Division facilities arose from a presentation from the Puget Sound Clean Air Agency (PSCAA) on ISO 14001 EMS systems. The County recognized an opportunity to expand employee awareness of sustainable business practices such as increased water and power conservation and environmental purchasing. The ISO 14001 standard was chosen as the model to implement an EMS at the County landfill.

Ms. Pamela Badger, Environmental Programs Managing Supervisor for the King County Solid Waste Division, provided the history and status of King County's implementation of its

ISO 14001 EMS. The EMS includes the Cedar Hills Regional Landfill, which handles approximately 1,000,000 tons/year of municipal solid waste, eight transfer stations, two rural drop boxes, and several custodial (closed) landfills.

The EMS implementation effort was begun in September 1999 and was fully operational in June 2002. The County sought and obtained a grant to implement its EMS from the U.S. Environmental Protection Agency (EPA) and used EPA's contractor, Global & Environment Technology Foundation (GETF), for workshops and guidance for development of its EMS. No consultants or other outside support services were used in the EMS implementation. The County reports that their expenses for implementing their EMS were on the order of \$11,000 to \$18,000 per quarter for three years, consisting primarily of staff time. Implementation required approximately 250 to 300 personnel hours per quarter for three years. Maintenance of the EMS currently is requiring approximately 200-250 personnel hours per year.

Implementation of the EMS established seven environmental categories to address, including:

- Landfill controls
- Landfill operations
- Transportation
- Waste transfer
- Administration
- Programs
- Maintenance

Review of the Solid Waste Division website currently indicates 19 aspects. Although specific significant aspects are not indicated, seven objectives and several related targets are listed. Based on these the significant aspects include:

- Energy consumption
- Air emissions
- Materials/resource consumption
- Hazardous materials and waste management
- Potential spills/leaks

The County reports that they do not use formal internal auditors to confirm the conformance of their EMS to ISO 14001. Rather, they use members of their EMS implementation team to provide ongoing checks of activities included under their EMS.

King County considered and rejected having their EMS certified by a third-party registrar because there were no specific drivers for certification, such as regulatory or user demands or market-specific drivers. The County did not see the need to bear the financial burden for maintaining certification, and by not certifying the County has the flexibility to limit implementation of select components of ISO 14001.

Although implementation of an EMS at the Cedar Hills Regional Landfill was encouraged by the local regulatory community, they had little involvement in the process. The County reports that the major challenge of implement-

ing and maintaining its EMS is finding the time needed to maintain its environmental programs and move forward on continual improvement. It also encountered resistance to change among some of its personnel regarding implementing its EMS programs.

The County now has a relatively mature EMS and reports several benefits have accrued to the County as a result (see Table 1 at http://www.scsengineers.com/Papers/APWA_Table_1_Jan08.pdf). One of the more significant benefits was the discovery of water leaks in their water distribution systems at the various transfer stations. This occurred as a result of their environmental aspect evaluation and effort to reduce their overall water use. The result of finding and repairing leaks and implementing water conservation practices has been a reduction in water use on the order of 1,000,000 gallons per year with the related reduction in wastewater discharge costs. Another significant benefit of the EMS was attaining a 12 percent energy reduction goal set for solid waste operations.

Southeastern Public Service Authority, Chesapeake, Virginia

The Southeastern Public Service Authority (SPSA) is an integrated solid waste management organization of approximately 440 to 450 personnel, under the direction of Mr. John Hadfield, Executive Director. SPSA serves 2,200 square miles of southeastern Virginia, including two counties, six cities, and the Norfolk Naval Shipyard. Their service area includes 1.2 million citizens. Mr. Richard Cheliras, Director of Waste to Energy, and Ms. Tanya Bray, Technical Research Analyst and EMS Coordinator, provided the history and status of SPSA's experience with implementing and maintaining its ISO 14001 EMS.

The scope of SPSA's EMS covers all of the facilities and activities in its service area. These include:

- A regional landfill handling approximately one million tons of waste per year.
- A waste-to-energy facility that provides power to the naval station and the local power grid.
- Nine transfer stations.
- Recycling services.
- Compost and yard waste services.
- Metal and white goods recycling.
- Freon recovery.
- Household hazardous waste management.
- Proprietary waste management and disposal program.

All of the facilities and activities listed above are included in the ISO 14001 EMS certificate issued by the third-party registrar for the SPSA, LRQA (Lloyd's Register Quality Assurance).

SPSA implemented its ISO 14001 EMS as a result of the operational philosophy of Mr. Hadfield, who considers SPSA an environmental management organization that focuses its attention primarily on solid waste and related issues. Mr. Hadfield saw implementation of SPSA's EMS, following the ISO 14001 standard, as important to demonstrate to citizens and businesses that SPSA walks the talk. He also saw implementation of an EMS as a mechanism to realize cost savings, improve environmental compliance, and add credibility to SPSA's already robust environmental management activities.

The EMS was implemented under Mr. Hadfield's leadership and through the efforts of an implementation team of 11 personnel led by Ms. Bray. The 11 personnel were selected to represent all the facilities and activities of the SPSA and the team continues to maintain the EMS presently. Mr. Scott Whitehurst, Superintendent of Environmental Manage-

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ment, is the EMS representative as required by ISO 14001. The implementation team initiated its work in 1999-2000 and LRQA certified the SPSA to ISO 14001 on April 1, 2005. LRQA, like BSI used by Kent County, is a third-party registrar accredited to certify ISO 14001/EMSs.

The cost of implementing the EMS included LRQA, consultant, and internal labor costs. SPSA reported that the fees of LRQA to initially audit and certify the SPSA were \$20,000 and semi-annual surveillance auditing fees to maintain the certification are \$3,000 to \$4,000. Consulting fees were \$70,000 and included training and assistance to implement the requirements of ISO 14001. Training also included providing the initial internal auditor training for the implementation team. In-house labor costs for the first year of implementation were estimated to include a half-man year each for Ms. Bray and one assistant plus approximately four hours per week for each of the implementation team members. Following the initial year and in subsequent years, it is estimated that maintenance of the EMS is requiring approximately two hours per week per implementation team member, not counting SPSA internal auditing time, to meet ISO 14001 requirements.

Challenges encountered by SPSA include essentially all those listed in Table 1 (shown at http://www.scsengineers.com/Papers/APWA_Table_1_Jan08.pdf). However, SPSA has found that the most significant challenge is following up and tracking EMS performance, which is time-consuming and tedious. Numerous benefits have been gained from SPSA's EMS as listed in Table 1. SPSA reports that the more significant benefits include cost savings, compliance, credibility, and gaining its E-3 rating in the Virginia DEQ Environmental Excellence Program.

Waste Management, Houston, Texas

Waste Management (WM) is a private company specializing in the handling and disposal of residential, commercial and industrial waste. It has implemented ISO 14001 EMSs at three of its landfills in Pennsylvania due to the desire to improve public recognition of its proactive environmental activities at its landfills. These include the Alliance Landfill, Taylor, PA; Pine Grove Landfill Inc., Pine Grove, PA; and Grand Central Sanitary Landfill in Pen Argyl, PA. The company was encouraged by the Pennsylvania Department of Environmental Protection to pursue ISO certification.

Mr. Robert (Skip) Garner, Environmental Protection Manager of Waste Management for eastern Pennsylvania, provided information about the landfills, including more detailed information on his primary responsibility, the Pine Grove Landfill.

WM initiated implementation of their ISO 14001 EMS systems at the Alliance Landfill using the support of a consultant and efforts of its landfill personnel. Following certification of the Alliance Landfill, WM subsequently implemented an ISO 14001 EMS system at their Pine Grove Landfill and Grand Central Sanitary Landfill. Costs for implementing the EMSs declined as implementation proceeded. They included con-

sulting fees, WM personnel labor, and other direct expenses. The greatest cost was incurred with the initial EMS installed at the Alliance Landfill. Costs for subsequent EMSs for the Pine Grove Landfill and Grand Central Sanitary Landfill were reduced as the experience and procedures developed in the process at Alliance were applied to the other landfills.

Implementation of the Pine Grove Landfill EMS began in November 2004. WM expedited its efforts and was awarded its ISO 14001 EMS certification on August 19, 2005. WM used the services of LRQA (Lloyd's Register Quality Assurance). In developing ISO certifications at its three Pennsylvania sites, WM discovered that many of the required EMS elements were already in place and being practiced. Converting their EMSs to the ISO standard, while requiring some new protocols, largely consisted of translating and adjusting existing EMS protocols into a format more compatible with ISO standards.

WM identified environmental aspects of its landfills and, based on specific criteria established in its aspect assessments procedure, determined those that are significant. The aspects have remained unchanged since the EMSs were implemented.

WM reports that as part of their ISO 14001 EMSs, they have a procedure in place that requires that they perform environmental, health and safety reviews of significant, new or modified processes as part of implementing them. They report that this has provided the greatest benefit to WM because it has encouraged site staff to evaluate and take actions to better plan for possible environmental health and safety issues, and improves the ability to avoid or better plan for reaction to unexpected developments.

WM also reports that by virtue of implementing its EMS at Pine Grove Landfill they have been able to buttress their application for the National Performance Track Program of the EPA. This will accrue additional benefits at the federal level regarding their Title V air permit because of incentives the EPA provides to its Performance Track members.

Summary of Findings

Our interviews of these representative communities and organizations suggest that the ISO 14000 EMS process has proven quite beneficial. The environmental, health and safety review procedures put in place have enabled their teams to avoid unexpected environmental and safety issues, as well as to generate operational cost savings. Table 1, which can be viewed at http://www.scsengineers.com/Papers/APWA_Table_1_Jan08.pdf, highlights some of the specific benefits that have accrued to these organizations. As noted in our discussions, the experiences of these groups show that development of an effective ISO 14000 EMS program requires significant long-term investment of staff resources, adequate training, and additions of value-added consultant assistance.

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