DEVELOPMENT AND IMPLEMENTATION OF AN INTEGRATED COUNTY ENVIRONMENTAL DEPARTMENT
ISO 14001 ENVIRONMENTAL MANAGEMENT SYSTEM

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ABSTRACT

The Yonkers Joint Wastewater Treatment Plant, located in Yonkers, New York and operated by the Westchester County Department of Environmental Facilities, became the first wastewater treatment plant in New York State to be certified to the ISO 14001 Environmental Management System Standard. The standard is centered around the Plan-Do-Check-Act cycle of continual environmental improvement. The certification of the plant is part of an overall effort for eventual certification of the entire Department of Environmental Facilities organization, encompassing multiple wastewater treatment plants, solid waste facilities, and two water supply districts. During implementation of the Environmental Management System at the Yonkers facility, several critical Best Management Practices were implemented, including communication tools, an electronic operations & maintenance (O&M) manual, integrated standard operating procedures, and an environmental work order process. Lessons learned during the design and implementation of the system for the Yonkers facility will be transferred to the remaining facilities as the implementation of the Environmental Management System continues at the remaining facilities.

KEYWORDS

ISO14001, Environmental Management System (EMS), Best Management Practice

INTRODUCTION

During September 2006, the Yonkers Joint Wastewater Treatment Plant, operated by the Westchester County Department of Environmental Facilities, became the first wastewater treatment plant in New York State to be certified to the ISO 14001 Environmental Management System Standard. Certification of the Yonkers facility was a major accomplishment toward the development, implementation, and certification of an environmental management system for the entire Department of Environmental Facilities (DEF). The DEF organization includes a total of seven wastewater treatment plants, forty-two pump stations, two overflow retention facilities, twenty storm flow regulating chambers, approximately 194 miles of trunk sewers, two water districts, and a solid waste division. The wide variety of facilities to be covered under the EMS and their geographic separation coupled to provide unique challenges to the system development,
requiring careful planning, early involvement of diverse stakeholders, and flexibility. This effort required the involvement of all levels and divisions of the organization and county government, including the County Executive, DEF & plant management, operations, and maintenance personnel. Certification of the remaining six wastewater treatment plants is scheduled for 2007 with the entire department certification planned for 2008.

Certification of the Yonkers Joint WWTP was the first major test of the management system framework developed for the DEF Environmental Management System (EMS). The Yonkers Joint WWTP is a 120 MGD wastewater treatment plant with a discharge into the Hudson River immediately north of New York City. The Yonkers Joint facility is the largest facility managed by DEF with the largest workforce and the greatest operational complexity. Consequently, the Yonkers Joint facility was chosen as the first facility for development and implementation of the DEF EMS.

ISO, or the International Organization for Standardization, is a non-governmental organization, comprised of members from 157 countries, which sets consensus based standards, including standards for both quality and environmental management systems. The ISO 14001 Standard (the Standard) was initially finalized in 1996 and is centered around the Plan-Do-Check-Act cycle of continual environmental improvement. More specifically, the standard consists of seventeen requirements, or elements, which serve as the backbone of the standard.

MANAGEMENT SYSTEM OVERVIEW

The ISO 14001 Environmental Management System that DEF developed is based on a continual cycle of planning, implementing, reviewing and improving the actions that DEF takes to meet its environmental obligations. The ISO 14001 model for an EMS is based on five major phases, which incorporate 17 elements.

Development of the EMS began at the department level in August 2004 with the formation of an environmental policy and development of procedures for each of the seventeen elements of the ISO 14001 standard. Given that the EMS will eventually cover all of DEF, these procedures set the basic framework for how the entire organization would meet the requirements of the standard. The procedures and environmental policy were designed to accurately capture, and improve where possible, the overall management structure of the department and required the approval and involvement of top management of the organization.

Commitment & Policy

DEF defined and committed to an Environmental Policy relevant to the nature, scale and environmental impacts of the activities conducted at DEF, the products supplied by DEF, and the services rendered by DEF. To conform to the Standard, the policy includes commitments to prevention of pollution, compliance with environmental laws and regulations, and continual improvement of the EMS. The environmental policy establishes the overall sense of direction and the framework for the remaining elements of the EMS. The policy also establishes the criteria against which all subsequent actions are judged, serving as the foundation upon which the management system is built. The policy is available to the public. For these reasons, the
statements made in the policy were carefully formulated to ensure that the commitments were not overreaching, but achievable.

Planning Elements

Information and data gathered during the planning phase feeds into the rest of the EMS. An environmental aspect is any element of the WWTP’s activities, products, and services that can interact with the environment. An environmental impact is any change in the environment, wholly or partially resulting from the WWTP’s activities, products, or services. Impacts can be positive or negative. The significance of environmental impacts was also determined by DEF, consistent with its environmental policy.

Legal and Other Requirements to which DEF is bound were identified and Objectives and Targets, consistent with the environmental policy, were developed to address significant impacts and ensure continual improvement in environmental performance. Environmental Management Programs were then developed to establish the plans and their associated schedules, resources, and responsibilities to achieve these environmental objectives and targets.

Implementation & Operation

These elements ensure the resources and support mechanisms necessary to achieve the environmental policy and the objectives and targets are put into place. Structure and Responsibility requires that resources, in the form of people and time, be committed and an organizational structure to support the EMS is defined, documented, and communicated. Training, Awareness, and Competence requires the identification of training needs and the implementation of appropriate training. Procedures were also developed for Communication, both internally and externally, related to the environmental activities of DEF, in order to demonstrate management commitment, deal with concerns and questions, raise awareness, and provide information about DEF’s environmental performance. EMS Documentation, including a description of the elements and pointers to related documentation was developed. Document Control procedures were developed to ensure that documents can be located; periodically reviewed and are current, legible, dated, readily identifiable, maintained in an orderly manner and retained for a specified period of time. Having identified the operations and activities at DEF that are associated with significant environmental aspects, DEF developed documented procedures in those cases where their absence was judged to potentially lead to deviations from the environmental policy and the objectives and targets. All of these requirements are communicated to suppliers and contractors when appropriate. Emergency Preparedness and Response procedures and tools were prepared to ensure that there will be an appropriate response to unexpected or accidental incidents.

Checking & Corrective Action

Monitoring and Measurement requires that DEF’s EMS include specific procedures to measure, monitor, and evaluate its environmental performance, and to ensure the reliability of equipment or systems providing the data. A documented procedure for periodically evaluating compliance
with relevant environmental legislation and regulations was also developed. Critical to ensuring the continual improvement of the EMS is the Nonconformance, Corrective and Preventive Action process, which is used to investigate and mediate potential and actual non-conformances. DEF developed procedures for the identification, maintenance, and disposition of environmental Records. The requirement to establish and maintain a program for periodic Environmental Management System Audits serves as a check on the entire EMS.

Management Review

Management Review closes the continual improvement loop and requires that top management periodically review the EMS to ensure its continuing suitability, adequacy, and effectiveness.

BEST MANAGEMENT PRACTICES

Following the high-level management system development and the design of the overall system architecture, the implementation process began at the Yonkers Joint Wastewater Treatment Plant by addressing each of the seventeen elements of the ISO 14001 standard using the framework established for the entire department. Facilitating this implementation was a series of Best Management Practices (BMPs) that have become key components of the Yonkers EMS and will ultimately be used in the remaining facilities of DEF.

Aspect & Impact Posters

One of the key goals of a successful environmental management system is to establish the link between the daily activities of employees and contractors, how those activities interact with the environment (environmental aspects), and the activities’ ultimate impact on the environment. Understanding this relationship helps the organization modify activities as necessary to improve environmental performance through the reduction in the significant negative environmental impacts or enhancement of significant positive impacts. It also helps communicate to employees and contractors the importance of the activities performed at the wastewater treatment plant on a daily basis.

To facilitate the communication of this link between plant activities and environmental impacts, a series of Aspect and Impact posters was developed. In general, the posters correspond to the unit operations of the Yonkers Joint WWTP (e.g. bar screening, sludge digestion, activated sludge) and to the structure of the maintenance organization of the facility. Each poster outlines the significant environmental aspects and impacts for the specific area of the plant. Below each significant aspect and impact, the poster lists the specific controls in place to reduce negative impacts or to enhance positive impacts. An example Aspect and Impact poster is provided in Figure 1.
Adequate communication is a cornerstone of the ISO EMS standard, and is especially challenging at a large facility such as Yonkers and for a geographically and operationally diverse organization like DEF. Every individual who can have an environmental impact at the facility, including vendors, contractors, operations personnel and maintenance personnel must understand their role in the DEF EMS and how performance of their job can have an impact on the environment. Communication tools included posters, training sessions, handouts, contract documents, and bid specifications.

Training and communication tools were developed to help DEF communicate not only within the department, but also with supporting organizations including the Westchester County Department of Public Works, which administers all capital projects at the facility, and with contractors. It was recognized during the system development process that contractors presented a key challenge and opportunity to improve environmental performance. In addition to a contractor training program, DEF developed an EMS Guide for Contractors and Vendors. The guide provides an introduction to the EMS, communicates the Environmental Policy, provides a listing of some of the specific workplace hazards that may be encountered by contractors, and describes how the contractor can help the facility implement its environmental policy. Excerpts from the EMS Guide for Contractors and Vendors are shown in Figure 2.
Electronic Operations & Maintenance (O&M) Manual Integration

An existing electronic Operations and Maintenance (O&M) Manual was chosen as a platform for the DEF EMS. The revisions to the electronic O&M Manual combined traditional OEM information including parts lists and general operating instructions with facility specific standard operating procedures (SOPs), logsheets, and regulatory plans, providing operators and maintenance personnel a one-stop source of information for the facility. The electronic O&M manual was organized to align with the Plan-Do-Check-Act cycle of the Standard as shown in Figure 3. The electronic O&M manual serves as the documentation for the EMS, and helps insure that all documents are controlled; by accessing the manual, each employee is assured that they are accessing the most current version of any document or procedure.
Integrated Standard Operating Procedures (SOPs)

The ISO 14001 standard requires the establishment of documented procedures “to control situations where there absence could result in a deviation from the environmental policy, objectives, and targets.” Given that the DEF policy includes, as required, commitments to meeting regulatory requirements (e.g. permits) and prevention of pollution, DEF developed written procedures for the entire treatment process.

Throughout the years of operation of the facility, numerous directives, letters, work instructions, and standard operating procedures (SOPs) had been written and collected in a binder for the plant; however, the procedures were not well documented or communicated. As part of the development of the EMS, each of these procedures was reviewed, checked, and then consolidated into a series of SOPs grouped around each position in the facility (Figure 4). The cornerstone of the SOPs is the position-specific rounds procedure. The rounds procedure clearly indicates the areas of the plant for which the position is responsible, the environmental aspects associated with those areas of the plant and their operations, the applicable environmental regulations, and the specific responsibilities of the position.

Supporting each rounds procedure is a guidance document, which provides additional background information. For example, the rounds procedure for the Primary Plant Laborer includes a check on the primary sludge pumps. Additional information on the primary sludge pumps, including typical operating pressures and guidance as to the steps to take if a hot pump is encountered, are provided in the guidance document. Finally, additional SOPs for specific tasks are referenced in the rounds procedure. For the Primary Plant Laborer, these additional SOPs include SOPs for cyclone operation and dewatering the primary settling tanks.
Environmental Work Order Process

An Environmental Work Order process, including root cause analysis tools, was introduced and is used to perform preventive and corrective “maintenance” on the DEF EMS. During development of the EMS, DEF was in the process of migrating from an older maintenance management software package to Datastream 7i. The migration afforded the opportunity to fully integrate the concept of Environmental Work Orders into the traditional maintenance work order process. A separate work order type was established for the Environmental Work Orders in Datastream 7i. Management representatives and ISO Coordinators, charged with the daily functioning of the EMS, are able to easily review and track the Environmental Work Orders from their own computer.

CHALLENGES

Implementing an ISO 14001 EMS for a comprehensive county environmental department involves some specific challenges and opportunities not typically associated with implementation of an EMS. The operations of a wastewater treatment plants, water districts, and solid waste facilities are inherently environmental. Consequently, the environmental management system becomes the management system for the entire operation, since the ISO 14001 standard requires that any part of the operation which can have any impact on the
environment must be included in the environmental management system. Bringing the department under systems control was found to have significant benefits. Chief among those benefits is the preservation of organizational knowledge. Documentation of plant operator and maintenance personnel knowledge in SOPs and guidance documents helps preserve that knowledge when skilled personnel begin to retire from the organization. Systemic communication has improved dialogue both within DEF and between DEF and its contractors, vendors, and other county departments. By bringing each of the wastewater, water, and solid waste divisions under one system, communication between facilities and divisions can be fostered. The Environmental Work Order process has given employees the opportunity and responsibility to identify and perform preventive and corrective “maintenance” on the DEF EMS. As part of the Environmental Work Order process, the use of root cause analysis tools has led to a systematic approach to responding to, and learning from, nonconformities to the system.

LESSONS LEARNED

During the implementation process, several key lessons were learned. Top management involvement in the process is critical and can help foster support for an environmental management system. Existing systems should be used as much as possible and the environmental management system should fit your operations, instead of trying to make your existing systems fit the standard. The process will be new to many personnel, so it is critical to involve them, especially the operations & maintenance personnel as early in the process as possible. Implementing the system is additional work, but in many cases, it facilitates the implementation of BMPs, which can bring strong value to the organization.

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REFERENCES