Zero Waste Alliance

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Case Study—City of Portland, Oregon Wastewater Treatment Facility Enhanced Chemical Management System

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Introduction

In the process of treating municipal sewage and stormwater, a wastewater treatment plant is obliged to use many types of chemicals and compounds. Some, such as welding rod and cleaners, are used in the operation of the plant. Others are used in the treatment of sewage. The use of any chemical raises concerns such as

- Health risks to workers
- The risk that chemicals released from the facility could impact public and ecosystem health
- The need for sophisticated and expensive storage and handling equipment
- The cost of training workers in safety procedures
- The cost of practicing emergency responses in case of a spill
- Tost of disposal

With concerns like these in mind, and aware that toxic materials must not be allowed to build up in the environment, the City of Portland, Oregon adopted a sustainability policy in 1994. Each city bureau studied ways in which to meet the goals of that policy.

In accordance with the policy, the Bureau of Environmental Services (BES), which operates the wastewater treatment plant, adopted fourteen goals in 1999 designed to identify opportunities to implement sustainable policies and operation.

In January 2002, Zero Waste Alliance and the City of Portland completed a plan for managing and systematically reducing chemical use at the city's wastewater treatment facility. The facility is managed by the Wastewater Group, (WG). The plan, called the Enhanced Chemical Management System (EMCS), provides a structured way to manage the risks of chemical use at the facility. With funds from the Portland Development Commission, the Zero Waste Alliance and the BES collaborated on developing the EMCS.

Setting Up the ECMS

An effective chemical management system affects most departments of an organization, and cannot be a success without their willing participation. Involving those departments in the development process is the surest way to get their support. To this end, the development team included, in addition to a representative of BES and ZWA staff, the following persons, appointed by the treatment plant management.

- Administrative Services Manager
- Communications Manager
- Compliance Manager
- Hazardous Materials Manager
- Pollution Prevention Manager

- Acquisitions Manager
- Operations and Maintenance Manager
- Principal Engineer
- Senior Risk Specialist
- Senior Risk Representative
- Facilities Manager

The planning process began with the team reviewing the current and proposed regulations related to chemical use and practices. This ensures the WG will be aware of and be able to comply with all regulations.

ZWA conducted the initial review of current literature on new technologies related to chemical use and practices. This will be done in the future by the WG and is part of the continuing planning that ensures the WG will always have up-to-date information, understand trends, and know when more desirable alternative chemicals are available.

An essential part of the chemical reduction process was to ensure that both internal and external communications are carefully handled by appropriate employees. This ensures that communications regarding chemical use and their environmental impacts are carefully considered to avoid misunderstandings and promote the best image for the WG.

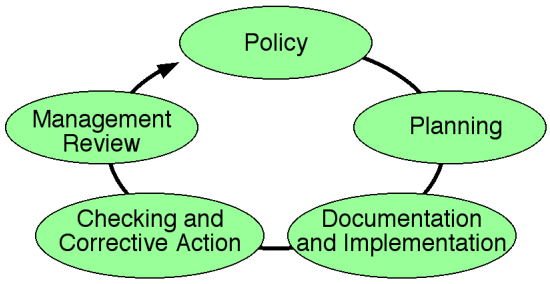
The development team decided on the elements that were to comprise the ECMS, and it established the requirements for each element. These elements included

- Communication (outreach, involvement, and external interactions)
- Chemical inventory process, including associated costs
- Processes for selecting the most significant chemicals and for reducing their the use and toxicity
- Procedures for action in the case of non-conformance to the ECMS requirements
- Compatibility with existing procedures such as safety, O&M, purchasing, and contracting
- Audits of the system to ensure continuing effectiveness
- An annual review of the system by management

This planning took a number of months of biweekly meetings. The team thoroughly discussed each element, identified the actions that the WG was currently taking and what actions should be added in order to meet the requirement. The crucial elements were already being addressed in some form, but they had not been collected into a system and documented so that the interrelationships were clear.

Using the ECMS

The ECMS system consists of the five major sections shown below.



It begins with an organizational policy, which is given form by comprehensive planning. Documentation is an integral part of implementation, since the ECMS manual consists of the procedures, plans and checklists that form the heart of the system. The plans include a system for identifying and correcting shortcomings of the ECMS, which are reviewed by management. The management review leads to further policy revisions and decisions, which return the system to another cycle of planning.

Once a year the WG makes a thorough inventory of its chemicals. This inventory includes data on chemicals purchased, used, stored and disposed of by City employees, contractors and vendors. It also includes information such as personal protective equipment, training and special storage requirements in order to understand the full costs of using the chemicals.

The WG uses data from that inventory, among other methods, to select chemicals for replacement or reduction. The group sets specific objectives, semiannual targets and develops action plans to include responsible personnel, resources needed and timelines for the replacement or reduction of various chemicals.

The CARS Database

The ECMS uses a database developed by ZWA called the Chemical Assessment and Ranking System (CARS) to identify chemicals that might pose problems. CARS includes chemicals that are regulated, targeted by state or federal agencies, or recognized by other reputable organizations as being of concern to human health and safety or to ecological health and the global ecosystem.

The following are some but not all of the criteria used to flag chemicals of concern. The database does not provide a measure of relative risk, but rather identifies the potential impact or inherent hazard of the chemical. The actual risk depends also on the exposure time and amount and on the vulnerability of the exposed.

- Known carcinogen
- Suspected carcinogen
- Teratogen (causes birth defects)
- Mutagen (causes mutations in reproductive cells)
- Ozone depleting substance
- Greenhouse gas
- Hazardous air pollutant
- Priority PBT (persistent, bioaccumulative toxin)
- PBT according to U.S. EPA’s RCRA Draft list
- Alleged endocrine disruptor
- Ranking on the Indiana Relative Chemical Hazard Score
- Listing on Toxics Release Inventory (TRI)

- Other reportable regulatory lists (CAA112(r), 112(b), RCRA Characteristics, etc.)
- List of environmentally preferred cleaning chemicals (U.S. EPA, others)
- Persistence

The database generates a list of noted properties or “flags” associated with each chemical. Flagging identifies chemicals of concern and provides information the WG can use to select chemicals for elimination or substitution most consistent with its values and policies. ZWA does not perform a comprehensive risk assessment. The flagging methodology allows the organization to identify known chemicals of concern and then to make choices based on their own values.

Selection and Prioritization

CARS only identifies chemicals with significant human and/or ecological health impacts. The priorities established by the development team govern the selection of chemicals to be reduced or eliminated and the priorities by which chemicals are chosen. Through discussion and review of the inventory and database screen, the development team established the amount of use, potential health, safety, and ecological impacts, and the costs associated with the chemical for ranking the chemicals on the list.

The results of this analysis show the value of a systematic approach. A few chemicals were found not to be in use and were simply disposed of in accordance with established protocols. Others were replaced with less harmful chemicals. Another class of materials had significant impacts but could not easily be replaced. The impacts of these materials risks are minimized by engineered controls and by establishing and enforcing safe working practices.

Other chemicals pose greater dilemmas. Some chemicals are dangerous and costly to store and use, but serve a necessary function and do not have ready replacements. An example of an important chemical with high costs, high amount of use, and high safety concerns is liquefied chlorine. Liquefied chlorine can be very dangerous under certain conditions and requires expensive facilities to handle and costly expertise to use safely. As a result using the ECMS, the bureau has embarked upon a study to find a replacement.

Results

Portland's wastewater treatment plant now possesses an enhanced chemical management system that identifies chemicals of concern and guides its employees in their goal of continual reduction of hazards and costs.

Using the ECMS may reduce chemical management costs by up to $100,000. It reduced reporting requirements by $50,000 and lowered the costs of safety management by $25,000. The potential annual savings is estimated to be $190,000.

Because these reductions of cost and exposure potential are research-based, systematic, and well documented, the reductions have no negative impacts on the efficiency or effectiveness of wastewater treatment at the plant. The system is continually updated and contains corrective action, auditing and reviewing provisions so that good ideas are recognized and made into policy, and so that policies change as circumstances change.