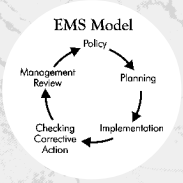
EMS CASE STUDY:



NOVOZYMES NORTH AMERICA INC.

Location:	Franklinton, N.C. (Franklin County)
Industry:	Misc. Industrial Chemicals (SIC 2869)
Pollution Prevention Application:	Environmental Management System (EMS)
Waste Reduction:	Not Calculated
Contact:	Jack W. Blackmer (919) 494-3378 or jkbl@novozymes.com

BACKGROUND

Novozymes, North America Inc. is located in Franklinton and manufactures industrial enzymes for use in detergents, baking, beverages, textiles, pulp and paper, leather, starch, sugar and alcohol. The Clayton location, known as Novo Nordisk Pharmaceuticals Industries Inc., manufactures pharmaceuticals. The Franklinton plant employs 350 full-time workers and 50 contract workers. It is subject to a synthetic minor air permit, a NPDES permit for cooling water and storm water discharge, and permits for spray irrigation of treated wastewater and land application of spent biosolids. In addition, the facility is classified as a small quantity generator under the Resource Conservation and Recovery Act (RCRA) and it must also follow the Clean Air Act Risk Management Plan for the storage and use of anhydrous ammonia.

The corporate offices of Novo place a high value on environmental issues. The company considers environmental performance to be crucial to effective operations and to the triple bottom line of integrating financial, social and environmental values into business practices. The corporate headquarters in Denmark requires all of its facilities to conform to the International Chamber of Commerce's Business Charter for Sustainable Development. In addition, Novo produces an environmental and social report annually that details environmental performance for the entire company and each facility. The Franklinton facility was already ISO 9001 Quality Management System (QMS) certified when the corporate headquarters required all of its enzyme manufacturing facilities to become ISO 14001 certified. Underwriters Laboratories Inc., a third-party accredited registrar, certified the Franklinton plant to ISO 14001 on May 15, 2000.

PLANNING AND IMPLEMENTATION

The Franklinton facility integrated its environmental management system (EMS) it with its already existing quality management system (QMS). Novozymes calls its EMS the Environmental Quality System (EQS). The planning and implementation of the EQS was the responsibility of the environmental management representative and several cross-functional teams at the facility. The teams included an eight-employee steering committee and a 16-employee working committee.

The facility began implementation of its EQS by having each department identify activities that needed to be analyzed for aspects and impacts. The steering committee was responsible for determining aspects and impacts for each of the identified activities. Novozymes' identified aspects included, but were not limited to, laboratory waste, solid waste, water use, erosion, odor, energy and noise pollution. The facility's impacts consisted of hazardous waste, air quality, depletion of landfill space, soil quality, water quality, depletion of resources, excessive noise, energy consumption and other environmental impacts. The process of identifying aspects and impacts took the facility 1,500 total person hours over the duration of 10 months.

Each department looked at existing controls for each impact and gave the impact a rating code based on these controls. The rating codes are described as follows:

1 Needs attention or there is high opportunity for improvement.

2 Possible opportunity for improvement.

3 Current controls are sufficient. Little or no opportunity for improvement.

To determine significance, the steering committee categorized and consolidated all the aspects that received a rating of 1. These aspects were then ranked on a scale of zero to five (zero being low and five being high) according to the following five categories:

- Area of impact
- Quantity of impact
- Probability of impact
- Potential regulatory or legal exposure
- Health risk

To determine the significance ranking for an aspect, the committee summed the scores given in each of the five categories for that aspect. The process of determining significance rankings for the identified aspects took the facility 100 total person hours over the duration of two months.

The steering committee and the working committee considered business-related factors in establishing objectives and targets. The aspects that were ranked for significance above were re-ranked on another scale of zero to five according to the following categories:

- Controls in place
- Difficulty in reducing the impact
- Cost of reducing impact
- Public relation/community concern
- Cost recovery period

For each aspect, the committees took the sum of the scores in each category to determine the business practicability ranking. The teams then subtracted the business practicability ranking from the significance ranking to get a final ranking. The committees considered all aspects when objectives and targets were being set. Once the objectives and targets were set, the decisions made by the committees were reviewed and approved by the site president. The entire process took the facility a little over two years to complete.

CONTINUAL IMPROVEMENT

At Novozymes, all employees are made aware of their environmental responsibilities through written job descriptions and annual performance reviews. Environmental performance is measured quarterly and reviewed by corporate headquarters. Implementation of the EQS has improved facility compliance by increasing awareness of potential areas of noncompliance, which allows corrective and preventative action to avoid potential problems. In addition, realization of objectives and targets has reduced company emissions and wastes. Facility performance has also improved by reducing the operating costs associated with materials, water use and energy consumption. Novo developed new requirements for bulk raw material suppliers and has begun to focus on the environmental impacts of transportation of raw materials, products and wastes. Maintenance of the EQS requires one-third of the environmental managers' time and approximately three hours a month from each member of the cross-functional teams.

LESSONS LEARNED

The increase in employee awareness of their impact on the environment has been the greatest benefit of Novozymes' EQS. Improvements in the areas of communication, employee work practices, new product evaluation, training and emergency procedures have been realized as a result of EQS implementation. Although the company previously had a committed relationship with the community, stakeholders and regulators, the EQS provides a consistent platform for monitoring environmental topics. Novozymes' greatest challenged rested in identifying aspects and impacts; however, the final method employed proved to be effective.

COST INFORMATION

Below is a chart of the estimated costs associated with implementing the EQS:

Staff Time	$175,000
Materials	$4,000
Consultants	$20,000
Compliance Audit (third party)*	$3,000
Auditor Training	$8,000
Other Training	$3,000
Registration Audit	$12,000
Total	$225,000

* A third party compliance audit is not required for an EMS/EQS.

The Environmental and Social Report can be viewed at http://www.novozymes.com/old/press/environmentalandsocialreports/esr99/report.asp.