WASTE MINIMIZATION PROCESS REVIEW 2009

Environmental Quality Management Center

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Prepared By: _____
Ronald Taylor, Environmental Affairs Compliance Manager

Approved By: _____
Robert Kjelland, Director, Environmental Management Department

Approved By: _____
David Hibbard, Director, Environmental, Health, and Safety Division

REGULATORY BASIS

The Hazardous and Solid Waste Amendments of 1984 to the Resource Conservation and Recovery Act (RCRA) require that, whenever feasible, the generation of regulated hazardous waste be reduced or eliminated as expeditiously as possible. Section 3002(b) of RCRA requires certification of the following:

- The generator of the hazardous waste has in place a program to reduce the volume or quantity and toxicity of such waste to the degree determined by the generator to be economically practicable.

- That the proposed method of treatment, storage, and/or disposal is a practicable method currently available to the generator that minimizes the present and future threat to human health and the environment.

In accordance with 401 KAR 38:090 Section 2(24) and 401 KAR 38:030 Section l(12)(h)4, this document provides the means to certify that a waste minimization program is in place for the University of Kentucky, provides a review of the program, and assesses the potential methods and associated costs for the next calendar year.

UNIVERSITY POLICY

A requirement of the University of Kentucky's Hazardous Waste Management Permit as a Treatment, Storage, and Disposal Facility and an essential element of hazardous waste management at the University is waste minimization whenever practical. The University is committed to the reduction of hazardous wastes offered for ultimate disposal through permitted RCRA facilities. Faculty and staff are expected to assist in identifying and implementing opportunities as described in this document to achieve the maximum feasible reduction. The University, through the Environmental Management Department has identified the key components to track the waste minimization efforts and accomplishments on an annual basis.

TRAINING

The Environmental Management Department has developed a Hazardous Waste Management Training Course which includes a module describing the requirements and potential methods for achieving waste reduction. This module also highlights the expectation that generators of hazardous waste will develop strategies to reduce the volume and toxicity of hazardous waste generated. All faculty and staff who generate or manage hazardous waste are required to complete this training initially and then annually thereafter.

In addition to the training course, communications tools such as a Waste Minimization poster, a poster describing University requirements for management of mercury, and a post card handout advertising the Environmental Management Department's mercury thermometer exchange program have been developed. These items have been posted in strategic locations and also handed out to the generators of hazardous waste for communication in individual labs.

WASTE MINIMIZATION METHODS

It is recognized that waste minimization activities must meet the expectation of the researcher or other end user in achieving the expected operational results. Due to familiarity with existing materials, research protocols already in place, and a reluctance or requirement to not deviate, these positions may serve as an impediment to the waste minimization process. Additionally, the difficulty in the Environmental Management Department being made aware of all minimization areas in order to track the successes serves as an impediment to the overall process.

The following methods and practices are in varying stages of implementation and maturity at the University to help achieve the expectation to reduce the volume and toxicity of waste generated and to support the Campus Sustainability efforts. It is recognized that not all solid wastes generated meet the criteria for Hazardous Waste and that the focus of a RCRA required Waste Minimization program is in the reduction of Hazardous Wastes. However, many of the possibilities for reduction of Hazardous Waste also offer opportunities for overall waste reduction, including non RCRA wastes. Therefore the methods described below are based on a knowledge of the University's waste generation process and an evaluation of the potential opportunities to achieve reductions in volume and toxicity of hazardous waste and include some reduction opportunities for non hazardous wastes. Many of these minimization methods require the diligence of the UK community. And all members of the University faculty, staff, and students are encouraged and expected to seek out and implement as appropriate waste minimization methods.

- ***Substitution***

  Substitution policies and practices encourage replacing a chemical with a less toxic or hazardous chemical in research projects and laboratories. It is recognized that the researcher must consider whether the substituted material still provides acceptable results. Optimally the decisions regarding substitution will be made at the beginning of the project or laboratory experiment, prior to purchase of the more hazardous material. Some examples of substitution opportunities are:

IF THE FOLLOWING IS USED:	**CONSIDER SUBSTITUTING:**
Xylene, benzene and toluene containing reagents in histology laboratories	Citric acid based reagents
Standard xylene or toluene based cocktails in radioactive tracer studies	Non-hazardous proprietary liquid scintillation cocktails
Solvent based inks in printing operations	Soy based inks
Mercury thermometers	Electronic or non mercury thermometers
Solvent extraction	Solid phase or supercritical fluid extraction
Solvents for glassware drying	Oven drying
Sulfuric acid/ potassium dichromate (chromerge) cleaning solutions	Detergents and enzymatic cleaners

Ethidium bromide	Commercially available, environmentally friendly DNA gel stain. Some examples are SYBR Safe, SYBR Green, GelRed
Phosphate chloride detergents for lab glass washing	Non-phosphate, non-chloride detergents
Paints and strippers	Use latex based products rather than oil based
Methanol in dehydrating and rinsing processes	Ethanol
CFC containing solvents and gases	Keeping safety in consideration, compressed oxygen
Formaldehyde for tissue preservation	Ethanol or less toxic material such as glycerin

The University has eliminated all of the parts washers on campus that use mineral spirits, a flammable liquid and a hazardous waste as a spent solvent. These units were replaced with parts washers that use a non-flammable solvent, which in addition to being a substitution is also recycled.

Additional successful and ongoing substitution activities are the replacement of fluorescent bulbs with "green tipped" environmentally friendly bulbs which may be disposed of a non hazardous solid waste and the use of electronic ballasts for fluorescent lights, replacing the PCB containing ballasts.

- ***Chemical Reuse and Sharing***

Chemicals received by the Environmental Management Department are evaluated for the possibility of being reused as an acceptable reagent in other areas of the University. Materials received in originally sealed containers that are not photosensitive, temperature sensitive, and not expired are posted on the department web site to be claimed by users in the University. The materials, available for reuse are also highlighted on the sign in page of the University's waste management tracking system, E-Trax. The EM staff delivers the chemical to the new user at no charge to the UK community. The program not only cuts down on the amount and cost of waste disposal, but also avoids the purchase cost of new chemicals.

Users in the UK community are also encouraged to share small quantities of chemicals between trusted researchers rather than purchase a full container if a very small quantity is needed for a particular process.

- ***Quantity Reduction***

Greater use of micro chemistry is being pursued in the research and teaching laboratories as well as in the pilot manufacturing facilities which reduces the amount of waste generated due to the smaller initial volumes of material. Also, through University purchasing practices, those individuals and departments requiring the purchase of hazardous materials which may eventually become hazardous waste are encouraged to purchase the smallest feasible container

size. This reduces the hazards associated with storage of the material, reduces the potentially spilled volume in the event of emergency, and reduces the potential for the material to expire or if it does expire reduces the volume of waste.

Maintenance of a chemical inventory is another method used to support quantity reduction of chemicals across the University. An inventory is maintained for all locations. The maintenance of this inventory helps to encourage units to monitor shelf life and rotate their materials so they are used for their intended use before they have expired. Additionally this inventory system helps to insure that duplicate orders of stock chemicals are not made and that the quantities maintained are appropriate for the need.

The University's facilities and housekeeping staff has reduced the use of cleaning chemicals from 19 products to 4.

- ***Recycling***

Recycling of hazardous materials provides the opportunity to extract raw materials from what would have been waste and then use the recycled material in a beneficial manner. UK, through the Environmental Management Department collects some recyclable materials and then makes them available to the University community or sends them to off-site facilities for recycling.

As mentioned above in the discussion of substitution activities, the non – flammable solvent in the parts washers across the University is recycled for use rather than being disposed of as a hazardous waste.

The "non green tipped" fluorescent bulbs are collected at the Environmental Quality Management Center, bulked into large shipping drums, and then shipped to a recycling contractor.

One source of potential hazardous waste is used but not spent batteries. The EQMC receives batteries from units across the University after they have been used. Due to particular operational protocols, many times these batteries are still useable. The items are tested by EM personnel and the good batteries are made available to the UK community at no charge.

In an attempt to curb heavy metals disposal, the University recycles computers and other electronic scrap. During 2007 through 2008, 178,886 pounds of electronic waste were recycled.

Other significant initiatives include recycling lead from radioactive materials labs and the firing range, silver recovery from photo labs, and oil and antifreeze. Additionally, unneeded paint from the University's paint shop is sold at auction.

- ***Reverse Distribution***

The UK Healthcare facilities maintain an arrangement with their pharmaceutical suppliers in which expired or otherwise unusable pharmaceuticals are returned to the supplier for management. This process reduces the amount of waste generated at the University, particularly in the areas of the pharmaceutical products that exhibit RCRA or RCRA – like characteristics.

- ***Treatment***

  The Environmental Quality Management Center is a RCRA permitted facility authorized to perform some treatment processes. This treatment, through small scale chemical reactions, renders a RCRA hazardous waste to be less toxic, non toxic, or non regulated through pH neutralization or other means. The EQMC has a 228 square-foot treatment room that enables Environmental Management to perform these small-scale chemical reactions in order to render selected chemicals non-hazardous, removing them from the hazardous waste stream so they can be disposed of "down the drain" to the City of Lexington POTW or as a non hazardous waste. Examples of these activities are the neutralization of acids and bases (corrosive liquids) and the chemical reduction of oxidizing agents

- ***Bulking, Separation, and Other Physical Processes***

  The Environmental Management personnel transfer compatible chemicals and other toxic chemicals from many small containers, which may or may not be full, into 55-gallon drums that are stored until completely filled while maintaining an inventory of the drum for shipping determination and identification purposes. These compatible materials include halogenated and non halogenated solvents, toxic liquids, and waste oils. Many of the bulk drums are then vacuumed into a vacuum truck for final disposal which offers the opportunity to then reuse the drum rather than disposing of it. In the past, these wastes would have been shipped in "lab packs," multiple containers in drums filled with a material such as vermiculite to keep the containers from breaking, resulting in a larger quantity of individual containers entering the hazardous waste system.

  Separation of waste types is another method in which overall waste is minimized. The generators of potentially hazardous waste are trained as part of the annual hazardous waste training to maintain segregation of incompatible wastes as well as the requirement to separate non hazardous waste from hazardous waste. Additionally, EM personnel sort and segregate materials received into the EQMC to properly characterize the materials for the most effective, approved disposal method. These efforts, particularly the separation of non hazardous from hazardous waste results in a reduction of RCRA regulated waste as well as a reduction in disposal costs.

  The quantities of two other waste streams were reduced by improved separation and bulking. Lead-based paint waste, which results from renovation projects and sidewalk curb repair, is collected and consolidated in a manner to exclude soil and other non-lead debris that formerly added to the amount of lead waste. PCB waste, which results from transformers and light ballasts removed or replaced by the Physical Plant Division, is also handled at the EQMC. Environmental Management works closely with the physical plant to collect, store and properly dispose of these items without extraneous non-PCB debris

  Intact compressed gas cylinders are considered hazardous waste, even when they are empty. Environmental Management dismantles gas cylinders to remove them from the hazardous waste stream. Environmental Management no longer ships any intact, empty cylinders.

DOCUMENTATION OF WASTE MINIMIZATION EFFORTS AND ASSOCIATED COSTS

The Environmental Management Department, through the Environmental Affairs Compliance Manager, has established current baseline efforts in order to track waste minimization achievements on a net assignable square footage basis. Therefore the tracking is done, not only on an overall basis, but also on a per unit basis to level the data to account for facility changes. These results are reported at least on an annual basis, used to identify areas for focus, and used in conjunction with the Campus Committee on Sustainability to support the overall University efforts.

These efforts, to date, have not been predicated on cost of implementation. The University has focused on identification and implementation of the identified methods as well as the heightened awareness of the potential waste minimization opportunities.

TECHNOLOGY REVIEW AND INFORMATION SHARING

The Environmental Affairs Compliance Manager and the Director, Environmental Management periodically assess the waste minimization efforts at peer institutions as well as through literature and contacts received in order to determine potential applicability to the University operations. Appropriate information is maintained on the department's shared computer drive.

KEY OBJECTIVES FOR CALENDAR 2010

- Reinforce the chemical redistribution list to be "real time", accurate, and readily available to the University community.
- Establish additional routine communications tools to continue to reinforce and make the University community aware of the obligation and opportunities to achieve waste reduction and reduce costs.
- Maintain the waste generation and the waste reduction achievements across representative areas of the University in order to assist in identification of additional waste reduction opportunities.