CONTROL TECHNOLOGY ASSESSMENT OF HAZARDOUS WASTE DISPOSAL OPERATIONS IN CHEMICALS MANUFACTURING

WALK-THROUGH SURVEY REPORT

OF

TENNESSEE EASTMAN COMPANY
KINGSPORT, TN

SURVEY CONDUCTED BY:
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National Institute for Occupational Safety and Health
Division of Physical Sciences and Engineering
Engineering Control Technology Branch
Chemical Industry Section
Cincinnati, Ohio 45226

PURPOSE OF SURVEY:	To conduct a preliminary study of hazardous waste disposal operations in chemicals manufacturing with a view to documenting exemplary controls.
EMPLOYER REPRESENTATIVES CONTACTED:	William A. McGee, Manager Industrial Hygiene Larry A. Miller, Operations Supv. Incineration and Wastewater Treatment Peter E. Morrisette Waste Treatment Development Dan Bensing Clean Environment Program
EMPLOYEE REPRESENTATIVES CONTACTED:	None
STANDARD INDUSTRIAL CLASSIFICATION OF PLANT	Chemical and Allied Products (SIC 28)

INTRODUCTION

The Resource Conservation and Recovery Act (RCRA) (PL-94-580) of 1976 was enacted to provide technical and financial assistance for the development of management plans and facilities for the recovery of energy and other resources from discarded materials, for the safe disposal of discarded materials, and to regulate the management of hazardous waste. Under Subtitle C of RCRA, the Environmental Protection Agency (EPA) was required to promulgate regulations on identification and listing of hazardous wastes and regulations affecting the generators, transporters, and owners/operators of facilities for the treatment, storage, and disposal of hazardous wastes. These regulations appeared in the Federal Register on May 8, 1980. Amendments affecting the listing of hazardous wastes appeared in the Federal Register November 12, 1980.

There are between 35 and 60 million tons of hazardous wastes generated annually, of which, about 15 million are generated by industries in the Chemical and Allied Products Sector (SIC 28). These wastes contain toxic substances which may also be carcinogenic, mutagenic, and teratogenic. Some of the companies in SIC 28 treat, store, and dispose of the wastes that they generate. Wastes may also be transported to companies who specialize in the treatment, storage, and disposal of these wastes. This group of companies is classified as "Refuse Systems" (SIC 4953). It is estimated that about 6,200 workers are directly involved in the transportation, treatment, storage, and disposal of hazardous wastes from SIC 28.

There are many companies in both SIC 28 and SIC 4953 which are currently treating and disposing of hazardous wastes from chemicals manufacturing. Many of these companies also have hazard controls in place that are designed to protect the workers from known hazards, both during normal operations and during upsets or emergencies. The objective of this control technology study is to document and disseminate information on effective engineering controls, work practices, monitoring programs, and personal protective equipment. The NIOSH study will result in a technical report which will be designed to assist hazardous waste operators in their efforts to prevent worker exposures to occupational health hazards. Furthermore, an attempt will be made to present

a spectrum of available alternatives for hazard control in various treatment and disposal operations.

The implementation of RCRA regulations has created business opportunities in the area of hazardous waste treatment and disposal. This has also created employment opportunities reflected in a steady rise in the number of workers who are involved in the treatment and disposal of hazardous wastes.

The Occupational Safety and Health Act of 1970 (PL-91-596) was enacted to "assure safe and healthful working conditions for men and women." The Act established the National Institute for Occupational Safety and Health (NIOSH) in the Department of Health and Human Services. NIOSH was charged by this Act with the duty and responsibility to conduct research and develop guidance for preventing exposure of workers to harmful chemical and physical agents. In response to this legislative mandate, NIOSH has conducted major programs to document, develop, and disseminate information regarding the health effects of such agents. To complement these ongoing programs, NIOSH has instituted a major effort to prevent occupational health and safety problems through the assessment and application of control technology in the workplace.

This preliminary survey was conducted as part of a NIOSH project to assess and document effective controls in the routine disposal of hazardous wastes from chemicals manufacturing.

AUTHORITY

Two of the main policy objectives of the 1970 Occupational Safety and Health Act (PL-91-596) are to:

- Encourage employers and employees in their efforts to reduce the number of occupational safety and health hazards at their places of employment, and to stimulate employers and employees to institute new and to perfect existing programs for providing safe and healthful working conditions.

- Provide for research in the field of occupational safety and health with a view to developing innovative methods, techniques, and approaches for dealing with occupational safety and health.

Under Section 20 of the Act, the Secretary of Health and Human Services is authorized to conduct special research, experiments, and demonstrations relating to occupational safety and health as are necessary to explore new problems including those created by new technology.

Paragraph (d) requires the dissemination of the information obtained to employers and employees.

The National Institute for Occupational Safety and Health was established to perform the functions of the Secretary of Health and Human Services described in Sections 2 and 20 of the Act. The manner in which investigations of places of employment are conducted by NIOSH and its representatives is outline in the Code of Federal Regulations (Title 42, part 85a).

PLANT DESCRIPTION

The Tennessee Eastman Company (TEC), Kingsport manufacturing complex is a large facility that produces chemicals, fibers and plastics. It is located in Kingsport, Tennessee. Employment at the plant exceeds 13,000 and over 350 products are manufactured there. The plant was established in 1920 to produce methanol. The 670-acre plant site has grown to include 250 buildings. The principal products of the plant include hydroquinone, antioxidents, and inhibitors for use in plastics, polyolefins, cellulose acetate and celluosics, modacrylics, polyterephthalates and polyesters, and dyes.

HAZARDOUS WASTES GENERATED

The Part A application of TEC [EPA Form 3510-1 (6-80)] includes a listing of the wastes, their quantities, and methods of storage, treatment, and disposal. The major categories of the wastes include: (1) spent halogenated and nonhalogenated solvents from "nonspecific" sources (F001 through F005); (2) discarded commercial chemical products such as small quantities of 2,4-dichlorophenoxyacetic acid (2,4,-D); and (3) unspecified ignitable corrosive and reactive wastes.

HAZARDOUS WASTE TREATMENT/DISPOSAL OPERATIONS

Hazardous waste treatment operations at this plant included:

- o Biological wastewater treatment.
- o Incineration.
- o Special treatment and/or disposal.

Plant officials mentioned that recently biological wastewater treatment has been delisted as a hazardous waste treatment because of the dilute nature of the wastes.

Thermal treatment by incineration is carried out in two rotary kilns and one stationary liquid injection incinerator. The two rotary kilns are rated at 50 million BTU per hour each. Both are fitted with waste heat boilers and scrubbers. Only 10 percent of the solid waste incinerated is considered hazardous. The balance consists of plant refuse such as off-specification polymers, process residues, cardboard boxes, and paper.

The incinerators are operated around the clock by five workers on each shift. Operation of the two rotary kilns is achieved by one control room operator and two "outside" workers who: (1) hook-up trucks and dumpsters; (2) push trash into the incinerators; and (3) perform such tasks as starting pumps and taking readings.

Each kiln has five burners. One is for fuel oil and the other four are nozzles for burning waste liquids. The liquids are transported to the incinerator site either by 5,000 gallon trailers or 750 gallon portable tanks. There are provisions for transporting liquids from these portable tanks directly to the burner nozzles by using the pressure of the blanketing inert gas as the motive force.

Other treatments available on-site include:

- Dewatering of biological solids using belt filters.
- Thermal treatment of these solids in industrial coal-fired boilers.
- Thermal treatment of liquids in industrial coal-fired boilers.
- Detonation of impact sensitive materials.

HAZARD CONTROL TECHNOLOGY

GENERAL CONSIDERATIONS

The basic elements of control technology which are implemented to minimize or eliminate hazards in the workplace are: (1) engineering controls; (2) environmental and medical monitoring; (3) training and education that results in effective work practices; and (4) personal protective equipment. Engineering controls include ventilation, enclosure or confinement of operation, substitution of hazardous agent, process modifications, and automation.

ENGINEERING CONTROLS

The only engineering controls that were either witnessed or discussed with plant officials pertain to the incineration operation. Incoming trailers and portable tanks with liquid wastes are blanketed with inert gas and electrically grounded. The inert gas is a by-product of one of the manufacturing operations. While centrifugal pumps are used to pump liquids both to the stationary liquid injection incinerator and to the rotary kilns, the incineration facilities are designed with provisions to burn the wastes directly from trailers and portable tanks. This eliminates at least one source of potential exposure, and from a safety point of view, eliminates the potential of inadvertently mixing incompatible materials.

Workers who push drums directly into the kiln are required to don a safety harness to guard against accidently falling into the kiln.

The above are only examples of the engineering controls in place at the incinerators. Other safeguards against fire and explosion are also incorporated into the system design.

ADMINISTRATIVE CONTROLS

Company officials stressed that before a waste is generated, care is taken to determine whether it can be handled efficiently and safely. This determination is made on the basis of data obtained at the pilot stage of development. If the findings are positive, waste disposal authorization sheets are issued which include information on methods of disposal.

Materials to be incinerated are examined for heat and water content and composition with respect to halogens, sulfur, nitrogen, and metals. Composition is determined for individual waste streams and not mixtures of wastes. Only compatible materials are mixed. Each waste is reviewed by the plant reactive chemicals committee from the point of view of safety and health. An industrial hygienist participates in these reviews.

TRAINING AND EDUCATION

New operators are trained by existing operators (on-the-job training). Also, training sessions in a variety of subjects are conducted regularly. Detailed operating procedures are currently being written. The workers are trained to have respect for all chemicals. And rather than trying to make "chemists" out of the workers, they are trained to recognize RCRA hazardous waste labels which specify breathing, skin absorption, fire, and reactivity hazards and the ratings for each (low, moderate, or high). The workers are also trained in how to handle, or deal with emergencies involving the hazardous wastes. Recently, the State of Tennessee performed an inspection at the plant and approved the training program.

MONITORING

Company officials indicated that very little air monitoring for contaminants has been conducted in the area of the incinerators. The only operation of concern from an occupational health point of view is the handling of epoxies used in kiln repair work.

Medical monitoring is performed for all employees, including those at the incinerator site. Data on biological parameters that indicate the health of the various organs and their function are collected during routine yearly physicals or after acute exposures have occurred. The head of the medical department indicated that it is difficult to make conclusions about whether exposures have occurred from the biological parameters alone. Exposure data are necessary for adequate interpretation.

PERSONAL PROTECTIVE EQUIPMENT

Hard hats and goggles are worn routinely. If there is potential for spills to occur, rubber boots, rubber gloves, and face shields are worn.

CONCLUSIONS AND RECOMMENDATIONS

The TEC incineration facilities may be considered state-of-the-art from the point of view of environmental control technology. Presentations made by company officials and cursory observations made during the walk-through survey, indicated a deep awareness of health and safety issues associated with hazardous waste disposal.

In addition to a number of important engineering controls, exposures are potentially minimized or eliminated by the institution of training and medical monitoring programs.

This site is a good candidate for an in-depth survey.