CONTROL TECHNOLOGY ASSESSMENT OF HAZARDOUS WASTE DISPOSAL OPERATIONS IN CHEMICALS MANUFACTURING

WALK-THROUGH SURVEY REPORT

OF

DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

SURVEY CONDUCTED BY:
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DATE OF SURVEY:
June 18, 1981

REPORT WRITTEN BY:
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DATE OF REPORT:
August 1982

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:	Greg Dickson, Manager Industrial Hygiene Fred Sabel, Industrial Hygiene Douglas Robins, Production Supervisor, Environmental Operations Don Rapp, Regulatory and Legislative Issues Mark Spence, Industrial Hygiene Laboratory, U.S. Area Larry Rampy, Industrial Hygiene Laboratory, U.S. Area Ralph Langner, Corp. Medical
EMPLOYEE REPRESENTATIVES CONTACTED:	None
STANDARD INDUSTRIAL CLASSIFICATION OF PLANT:	Chemical and Allied Products Sector (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 chemical 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 outlined in the Code of Federal Regulations (Title 42, Part 85a).

PLANT DESCRIPTION

The Dow Chemical Company Midland plant is a large multiproduct facility in which plastics, pharmaceuticals, agricultural chemicals, and organic and inorganic chemicals are produced. Hazardous wastes generated by the manufacturing processes are treated in one of four different treatment operations. These are: (1) incineration; (2) wastewater treatment; (3) deep-well injection; and (4) landfilling. During this survey, the incineration operations were toured and discussed with plant personnel.

Wastes that are incinerated contain a wide variety of organic and inorganic compounds. The organic species are typically halogenated and nonhalogenated aliphatic and aromatic hydrocarbons and phenolics. Also incinerated are other common classes of organic compounds (such as aldehydes, ketones, amines, alcohols), and solid wastes (wastewater treatment sludge and refuse).

The incinerator facility, designed for 85 million Btu per hour (Figure 1), has an outdoor type of construction and is operated around the clock by 13 employees (3 to 5 per shift) with maintenance operations performed by additional manpower, as needed during the day. There are normally 15 to 20 truck drivers who transport the waste to the incinerator.

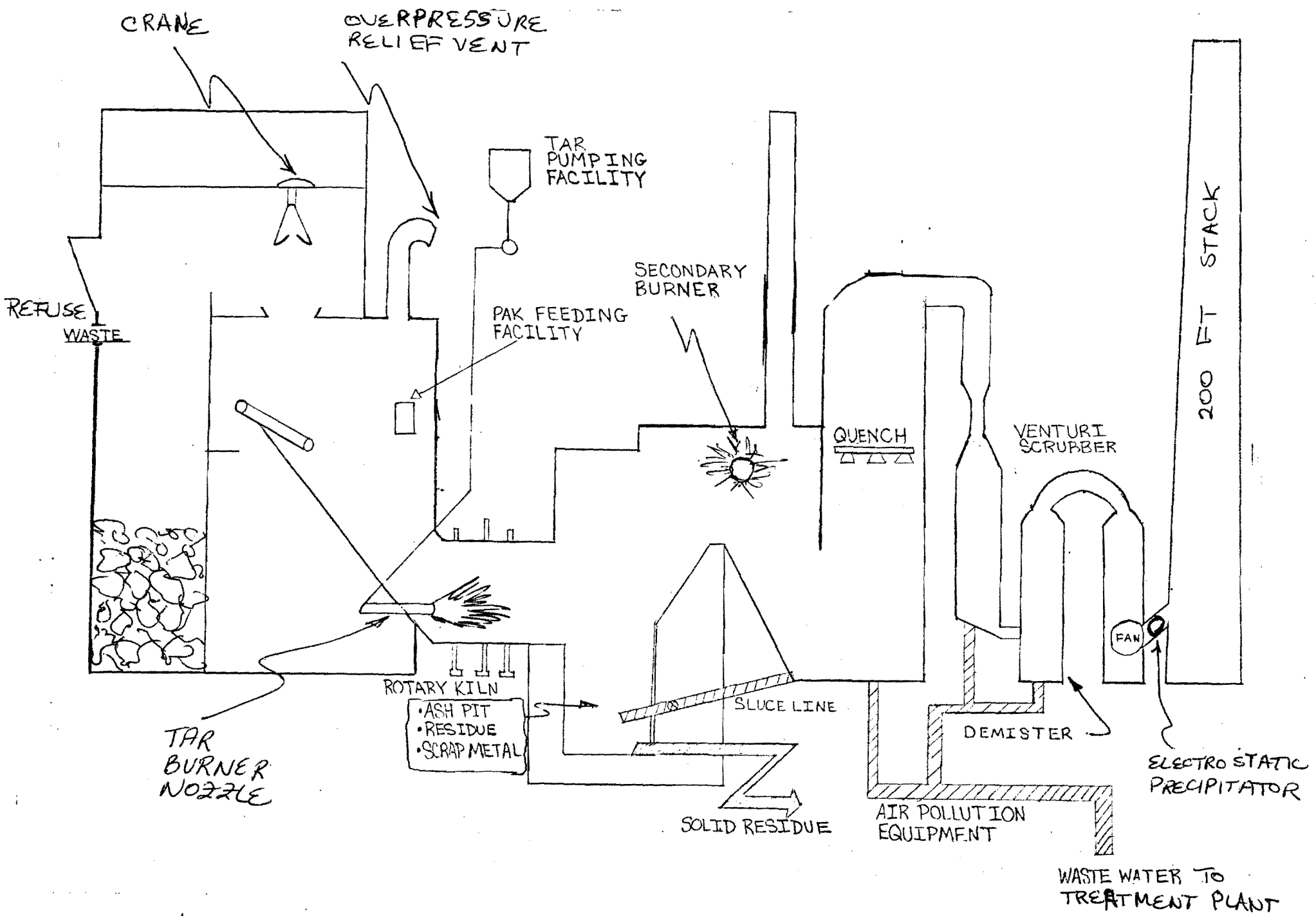

FIGURE 1. WASTE INCINERATOR DOW CHEMICAL MIDLAND, MICHIGAN

PROCESS DESCRIPTION

The incineration system consists of a rotary kiln and a standby stationary incinerator (called Thermo-Oxidizer) and air pollution control equipment with associated waste storage and pumping facilities. Figure 1 is a schematic of the rotary incinerator in which most of the liquid and solid wastes are burned.

Solid refuse wastes are collected in hoppers and are fed to the rotary kiln by conveyor. Drums are also fed to the kiln by a pack feed conveyor. Liquid wastes are classified according to their flash point and reactivity. Low flash point liquids are transported to the incinerator in cylindrical pressure tanks with special hose connections and valves. The contents of the tanks are directly fed to an incinerator burner by pressurizing the tanks or by pumping.

Other liquid wastes are transported in tank trucks which are hooked up to any of 12 unloading ramps. The liquids are discharged to storage tanks and subsequently pumped to mixing tanks (tar pump facility). Care is taken to only mix compatible wastes and special attention is paid to evening-out viscosity and Btu content.

Drums (55-gallon) and fiber packs are used to transport hazardous and nonhazardous wastes to the pack feed room. Drum usage is minimized. Drums are directed to the incinerator and none are stored on site. A pick axe is used to make slits in the side of the drum to reduce the potential for pressurization and explosion inside the incinerator.

Incineration of hazardous wastes is carried out using natural gas as supplemental fuel. Gases from the rotary kiln go through an afterburner for complete combustion, a quench chamber, a Venturi scrubber, a demister, and an electrostatic precipitator before exiting through the stack. Acid water from the scrubber is sent to the wastewater treatment plant. Ash from the rotary kiln drops into an ashpit and is trucked to a company-operated landfill.

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 industrial hygiene monitoring; (3) training and education that results in effective work practices; and (4) personal protective equipment. Engineering controls include process authorization reviews, ventilation, enclosure or confinement of operation, process modification, and automation.

ENGINEERING CONTROLS

During the survey, the tar pumping facility was not in active operation. The pack feeding facility was in operation, but close observation was not possible.

At the tar pumping, the engineering controls can include: (1) blanketing of tanks and tank trucks with inert gas; (2) grounding tanks and trailers; and (3) vapor emission and spill control techniques at the unloading ramps.

Safety devices and mechanisms that are incorporated into the rotary kiln operation include over-pressure relief valves and barriers that protect against fire and explosion for control room workers.

WORK PRACTICES

Work practices that are effective in minimizing hazards are the result of effective training and education. Workers at the incineration site receive training in recognizing RCRA hazardous wastes labels. Furthermore, there are also Dow labels for all material containers except those that are contained in process tanks, reactors, dumpster tanks, tank trucks, and tank cars. Red labels are used for dangerous materials. Blue and amber labels are used for materials of lesser hazards. These labels contain information about severity of and type of hazard, instructions on how to avoid injury, and treatment instructions.

All waste materials must be correctly labeled and tagged. Reactive materials are to be isolated from each other before sending to disposal.

MONITORING

Company industrial hygienists conducted area and wipe sampling at a number of sites in the incinerator area. Personal samples were not taken by the company because work tasks during a shift vary and each is performed for a short period of time. The results of the monitoring activities were not available at this writing. Medical surveillance in the form of annual physical examinations is available to the employees.

PERSONAL PROTECTIVE EQUIPMENT

The company has written procedures for line or equipment opening which apply to the operations of hooking up tankers and emptying containers of hazardous wastes. The procedures include specifications of personal protective equipment. Rubber suits and gloves, chemical workers goggles with soft sides, and the appropriate chemical vapor cartridge respirator for the particular chemical being handled are prescribed.

CONCLUSIONS AND RECOMMENDATIONS

Dow Chemical operates a state-of-the-art incineration facility. Presentations made by company officials indicate that all of the elements of hazard control technology are well represented in this operation. At this writing, NIOSH does not have adequate descriptions of the engineering controls, the monitoring activities, and training programs. However, a brief one-day in-depth site survey of this site would be useful if project resources would allow such. The survey would consist of one or two shift observation of the operations to allow NIOSH researchers to adequately interpret company-generated data and information.