

CONTROL TECHNOLOGY ASSESSMENT OF HAZARDOUS WASTE
DISPOSAL OPERATIONS IN CHEMICALS MANUFACTURING

Walk-Through Survey Report

of

Olin Chemicals Group
Charleston, Tennessee

SURVEY CONDUCTED BY:
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DATE OF SURVEY:
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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:

Verrill M. Norwood, Director
Environmental Affairs

EMPLOYEE REPRESENTATIVES CONTACTED:

None

STANDARD INDUSTRIAL CLASSIFICATION
OF PLANT:

Chemical and Allied Products Sector
(SIC 28)
2812 - Alkalies and Chlorine
2819 - Industrial Inorganic Chemicals

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 19, 1980. Amendments affecting the list 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 are classified as hazardous based upon being ignitable, corrosive, reactive, acutely hazardous, or toxic. 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 have 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 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 by 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 develop, document, 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:

- o 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.
- o 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 Olin Chemicals Group plant is located between the Lower River Road and the Hiwassee River in Bradley County, Tennessee, about two miles west of Charleston. It is a multi-product inorganic chemical manufacturing complex which produces chlorine and sodium hydroxide (caustic soda) using the mercury electrolytic cell process, sodium hydrosulfite (Reductone^(R)) using the mercury electrolytic cell process and chemical reaction process, calcium hypochlorite (HTH^(R)) using a chemical reaction process, and dry caustic soda by evaporation.

The hazardous wastes generated by the various manufacturing processes are mostly treated and disposed of on the premises by thermal treatment (retorting), then landfilling, or by landfilling directly. A certain amount of the hazardous wastes generated, in the form of spent halogenated hydrocarbons (approximately 10 drums per year), are disposed of by contractors off-site. The nature of the wastes and methods of on-site treatment and disposal are summarized in Table 1. It is estimated that 8,500 tons (wet basis) are disposed of at the Charleston plant annually.

Table 1. Major hazardous wastes generated.
Disposal at the Olin Charleston Plant.

HAZARDOUS WASTE	Thermal Treatment	Landfill Secure	Landfill Chemical
Brine sludge		X	
Thick mercury butter	X	X (ash)	
NON-HAZARDOUS WASTE	Thermal Treatment	Landfill Secure	Lanfill Chemical
HTH ^(R) (Off Spec.)			X

PROCESS DESCRIPTION

Hazardous wastes at this location result from the removal of impurities in the brine, treatment of mercury-contaminated wastewaters, retort ash -- from a mercury recovery thermal treatment system -- and incidentally, mercury-contaminated materials.

THERMAL TREATMENT - A recycle system. Not a hazardous waste treatment facility. Ash landfilled.

During normal chlorine, caustic, and Reductone^(R) manufacturing operations, impurities in the brine collect on the mercury to form "thick mercury." The major source of "thick mercury" is caustic filter backwash. Mercury is recovered from this substance by heating it in the oven of a retort (there are two at this plant). The mercury vapor produced is condensed and returned to the process.

LANDFILL A - Hazardous Waste

This secure landfill is for mercury-contaminated wastes only. These include brine sludge, retort ash, and secondary treatment sludge. The retort ash is put into a mobile lugger prior to landfilling. Brine sludge, continuously produced in the manufacturing processes, is dewatered and disposed here. It is periodically bulldozed to a sloped grade. Brine sludge consists of sand and other insoluble impurities from the process salt. It also contains mercury from the process. The amount depends upon the quantity of impurities in the salt. Brine muds constitute 85-90% of the waste disposed of in this landfill.

A new facility is being constructed to landfill the brine sludge. It has been delisted as a hazardous waste, since it is dewatered and passes the EPA criteria, i.e. leachate less than 25 times drinking water standard.

The hazardous waste landfill is constructed one cell at a time in order to minimize leachate generation. The leachate is pumped back to the plant for secondary treatment to remove the mercury. Mercury-containing wastewater at Olin is treated with sodium sulfide in a secondary treatment process.

The mercuric sulfide sludge is removed from the water using a filter press and sent to the landfill. This technology is BAT.

LANDFILL B

This landfill is used to dispose of off-specification HTH^(R) containing less than 15% available chlorine (about 1000 pounds per day). It is not a hazardous waste. HTH^(R) is landfilled separate from the brine sludge because the chlorine in the former will solubilize the mercury in the latter.

Most off-specification HTH^(R), i.e. available chlorine content below 65%, is recovered and re-processed.

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

Thermal Treatment

The retorting of thick mercury has the effect of removing mercury from the waste. This renders this "waste stream" less toxic. From the company point of view, the retorting operation is a recycle process which is an integral part of the manufacturing operation. However, it may also be considered an engineering control from a control technology point of view.

Landfills

No controls beyond those normally found at secure landfills are present at this site.

ENVIRONMENTAL AND MEDICAL MONITORING

Environmental Monitoring

Periodic monitoring is conducted to determine the concentration of mercury vapor associated with various jobs and locations. Hopcalite is used as the

adsorption medium for personal and area mercury vapor monitoring. The Jerome Gold Film Mercury Detector is also used for mercury vapor monitoring.

Some jobs, e.g. cell maintenance, require posting of the area, special safety equipment, and special work procedures.

Medical Monitoring

A medical monitoring program was established in 1964 for monitoring the worker's urine to determine the concentration of mercury. The plant physician has observed a seasonal variation in urine-mercury concentrations. It is believed that this variation is a function of ambient temperatures and its direct effect on the vaporization of mercury. Specific limits are set for allowable mercury-in-urine and workers are removed from exposure when any limit is exceeded.

Training

Employees at Olin are trained to perform their job tasks in a manner that will afford them continued safety and health.

Personal Protective Equipment

Hard hats, safety shoes, safety glasses, and an escape-type respirator for chlorine gas are required equipment throughout the plant. A respirator for mercury vapor (3M Disposable Mercury Vapor Respirator No. 8707) is used where monitoring indicates an exposure potential. Employees in areas where exposure warrants are also provided uniforms which are changed daily and laundered at the plant. Additional safety equipment would include gloves and rubber boots if they are needed.

CONCLUSIONS AND RECOMMENDATIONS

The hazardous waste disposal and treatment operations at the Olin Chemicals Group plant are considered well-controlled. Discussions with plant officials indicated an awareness of the important issues of safety and health. The hazards demonstrated here are less severe relative to other plants surveyed. Therefore, the site is not recommended for further study at this time.