

Safety Guide SG-9

RECOMMENDED SAFE PRACTICES
AND PROCEDURES*Disposal of Hazardous Waste*

This Safety Guide has been prepared as an activity of the General Safety Committee of the Manufacturing Chemists' Association. Pre-planning of any aspect of chemical manufacturing will do much to accomplish safe results. It is hoped this guide will assist in such pre-planning.

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Disposal of Hazardous Waste

- I. **PURPOSE.** The purpose of this guide is to call attention to the hazards involved in the disposal of certain types of waste materials and to the legal difficulties and poor public relations which may result if proper disposal of these materials is not carefully planned and regularly carried out.

Any full discussion of the problem and methods of handling these materials is impractical within the limitations of this guide. It does, however, outline a basic method of approach which has been found to work reasonably well in a number of chemical organizations faced with a wide variety of waste disposal problems.

It should be noted that very serious problems of air and stream pollution, as well as serious hazards to plant personnel, may be created by the wastes resulting from a very small chemical operation. *The basic methods outlined in this guide are applicable to the very smallest of chemical plant operations as well as those of considerable magnitude.*

- II. **DEFINITION.** While waste disposal includes the proper disposal of all unwanted materials, *this guide is limited to suggestions for the handling of flammable liquids, toxic and corrosive materials and other substances which may create an air or stream pollution problem. Also included are suggestions in regard to the handling and disposal of unstable materials and leaking containers of dangerous gases or liquids.*
- III. **RESPONSIBILITY.** It is of the utmost importance to place the entire matter of waste disposal under the coordination control of a single individual or department specifically charged with that responsibility. The responsibility may be placed directly upon the plant safety organization or may be in some other operational unit. In any event, the safety organization shall act in a consultative capacity and shall have sufficient control power to insure the carrying out of established safe practices, to take care of emergency situations and to provide for the development of safe methods. To do this, the cooperative assistance of the medical division or industrial hygienists is also required. In small organizations, the various functions may all be combined in a single individual but his several functions and responsibilities should be recognized.
- IV. **HAZARDS.** In addition to the normal fire and explosion hazards of flammable liquids and their vapors and the expected hazards of toxic materials, certain other hazards must be anticipated in waste disposal handling. Some material may be severely corrosive to drainage piping. Other materials react with water or may cause violent reactions when mixed with other chemicals present in the plant. Certain materials, relatively nonhazardous in themselves, may be objectionable because of their effect

on sewage disposal systems. The wide variety of these problems indicates the necessity of developing and maintaining a *hazard index*. Some assistance in developing this index may be obtained from the published materials in the attached bibliography. However, in many cases, hazards must be investigated by the plant itself.

Such a hazard index should be complete and include all materials handled at the plant or installation. It is usually desirable to develop a card file so that such information may be permanently and readily available. For this purpose, a suggested check-list of the type shown may appear on each card.

- V. **DISPOSAL INDEX.** In addition to the card file or hazard index above described, the reverse side of this card should describe the proper method of disposal for this specific type of material. One form of such a card is a "Waste Disposal Index" on which the proper method for disposal may be described and will include a description of the standard method of disposal together with exceptions which may apply under special circumstances. Certain materials may be listed in such an index in general groups or types and it may be also necessary to list mixtures of materials. In any event, the book should provide a ready reference for the supervisor so that he will know immediately how to handle any of the types of materials or situations which he may encounter. The services of the waste disposal organization and its consultants are, of course, available for situations not covered directly in the index, but an attempt should be made to cover the great majority of situations by standard procedures.
- VI. **METHODS.** Some commonly used methods of disposal are briefly described in the following paragraphs.

1. *Burning in the open.* Many materials may be safely disposed of by burning in the open. Safety to personnel can be assured by making arrangements for igniting the material from a safe distance. Packing material which is commercially available in the form of paper tubes filled with excelsior may be used as lighting trains. Employees doing this work need flame-proofed clothing and gloves and it is also essential to provide safety showers.

In open field burning, however, combustion is usually incomplete so that the smoke produced may contain larger amounts of unburned carbon and appreciable amounts of irritant and toxic materials. Such smoke clouds not only create a severe smoke nuisance in the neighborhood, but may also create serious conditions by bleaching of plants, toxic effects on live stock and toxic and very annoying nuisances to residents. Such irri-

HAZARD INDEX

CHEMICAL:—METHYL CELLOSOLVE					
Lump		Pyrophoric		Unstable	
Granular		Flammable (F.P.o.c.)	115°F	Shock Sensitive	
Powder		Water Soluble	∞	Corrosive	
Dusty		Hygroscopic		Toxic Vapor	✓
Fuming		Powerful Oxidant		Toxic on Contact	✓
Liquid (Colorless)	✓	Powerful Reducer		Irritant	✓
Freezing Point °F	−121	Reacts with Water		Carcinogenic	
Boiling Point °F	256	Reacts with Air		Radioactive	
Comment: Exposed personnel should wear chemical safety goggles. Store away from open flames and areas of acute fire hazard. Use dry chemical or CO ₂ to fight fires.					

Reverse of card

DISPOSAL INDEX

CLASSIFICATION:—Flammable Solvent				Issued: 1-56
CONTAINER	— TYPE: Bottles, Drums MAX. DIM.: MAX. WT.:			
DISPOSAL METHOD	— By controlled spraying into combustion chamber.			
DELIVERY POINT	— Incinerator, Bldg. 138			
PICK-UP	— Call Yard Dept., Phone 2412, 2414			
IDENTIFICATION	— "Material for Special Disposal" Tag KP 38512B			
COMMENTS	— "Moderately Flammable"	FP, °F, 107	Expos. Class B2-S2	Soluble in H ₂ O
METHYL CELLOSOLVE				

tating and noxious smokes may be carried over a wide area and cause damage to paint on residential property or other structures.

2. *Burning in incinerators.* While burning in incinerators under proper control can reduce most if not all of the smoke nuisance, the hazards created by flammable vapors or explosive solids in the incinerator structure may be quite serious. Chemical plant incinerators require expert design and the provision of automatic control to prevent the development of unsafe conditions.

It is usually possible through the burning of relatively harmless wastes such as ordinary waste paper, to build up temperatures in the "combustion chamber" or the "after burner" which are high enough to ignite flammable liquid vapors immediately and to cause decomposition of irritant and toxic organic compounds. Sufficient temperature control and interlocking devices are required so that these materials cannot be introduced into the furnace unless a proper operating temperature,

usually in the vicinity of 1700°F, is maintained. Great care is needed in the arrangement of flammable liquid tanks, piping and control valves. Safe clothing for workers, adequate showers and means of escape are positive requirements. Operations of this type must be under the responsible charge of competent operating personnel.

3. *Disposal through sewers.* While many water soluble materials may be readily flushed down sewers, great care is needed to avoid placing material in sewers which will create flammable vapor conditions, stream pollution problems, or which will upset the normal operation of sewage disposal plants. All disposal of wastes by this means must be in accordance with federal, state and local laws relating to stream pollution and to the type of material acceptable in the sanitary sewer system.

In instances where wastes are discharged directly into streams, special sewage treatment plants designed for the particular wastes encountered, may be necessary.

Great care must be taken to make sure that radioactive materials do not enter the normal waste disposal operation but are properly segregated and handled in accordance with recommendations of the Atomic Energy Commission.

4. *Reactive wastes.* Reactive chemicals which may cause a violent reaction when in contact with water or other common materials, require special treatment so that they may be made relatively harmless before disposal. Exact nature of this treatment will, of course, vary with the nature of the material.

5. *Explosive materials.* In general, standard procedures should be set up for the careful removal of shock-sensitive materials from locations within the plant to a disposal area where they may be safely destroyed, usually by burning. In some instances, it may be desirable to puncture containers by rifle shot or explosive charge. Great care, however, must be taken in such operations to prevent hazards created by ricochet of bullets and with proper permission from police authorities. Methods should be developed for picking up and safely transporting these materials to the disposal area.

6. *Disposal by burying.* While many ordinary materials may be safely disposed of by burying or land-fill operations, it should be remembered that water soluble materials may eventually leach into streams and wells and create a hazardous situation. Buried materials may also create a severe hazard when dug up during later construction or other earth-moving operations. Land-fill operations are acceptable for many ordinary materials of organic

origin but the use of this method should be carefully limited to those which will not cause hazards later on.

- VII. **COMPLAINT INVESTIGATION.** Responsibility should be assigned in regard to the handling of complaints which may arise from all types of plant operations, including waste disposal. All complaints in regard to odors, smoke and other nuisance conditions should be brought to the attention of one person or organization charged with investigating the origin of the nuisance. This work should be coordinated with that of industrial and public relations personnel and medical consultants.

Bibliography

- Lange—*Handbook of Chemistry*
 Merck & Co., Inc.—*The Merck Index*
 Chemical Rubber Publishing Co.—*Handbook of Chemistry and Physics*
 Sax—*Dangerous Properties of Industrial Materials—Second Edition*
 NFPA 325—*Fire Hazard Properties of Certain Flammable Liquids, Gases and Volatile Solids*
 NFPA Handbook of Fire Protection—Table 422, "Table of Hazardous Chemicals and Explosives"
 Safety Data Sheets of the Manufacturing Chemists Association, as well as those of the National Safety Council on specific chemicals.
 Manual Sheet P-1, "Air Pollution Abatement Manual" from the Manufacturing Chemists' Association
 Hunter—*The Diseases of Occupations*

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