# MIXED WASTES: HAZARD CONTROL AND HEALTH PROTECTION PROGRAMS

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## ABSTRACT

Nuclear facility operations generate radiological, chemical and mixed wastes which may pose hazards to workers. A facility licensed by the NRC is obligated to address worker protection. This paper presents elements of a program which can provide that protection.

## INTRODUCTION

Historically, health physics has received greater emphasis than industrial hygiene at nuclear plants. As the NRC grapples with problems associated with mixed wastes, the hazards presented by the chemical components are receiving increased attention. Because radiation protection activities are readily accepted, the discussion which follows focuses on industrial hygiene or chemical hazards protection.

## PROGRAM ELEMENTS

An industrial hygienist given responsibility for health and safety at a facility having chemical hazards would review and adapt government and professional organization guidelines to make them plant or site specific. Adaptation of the guidelines could be effectively completed to address hazard control and health protection associated with chemical and mixed wastes at a nuclear facility.

### Policies

Nuclear facilities generally have excellent histories addressing radiation and rad waste problems. Extensive written procedures exist and are implemented under a QA/QC program. The need to develop additional policies and procedures pertaining to industrial hygiene and chemical or mixed wastes is focalized by:

- new restrictions being placed upon mixed wastes disposal by the NRC and EPA;
- exclusion of certain chemically hazardous substances from burial sites;
- NRC recommendations to evaluate the radiological versus chemical toxicity of wastes to determine biological and environmental effects;
- EPA recommendations to evaluate certain characteristics including: flammability, explosivity, corrosivity, pyrophoricity, ignitability, reactivity and compatibility; and
- the need to provide right-to-know or hazard communication training.

### Facility Status -- Hazardous Materials Inventory

The potential for chemical or mixed wastes problems at a nuclear plant should be determined by establishing an inventory system. The system must generate records which:

- provide material identification;
- identify incoming hazardous materials;
- identify both radiologically and non-radiologically contaminated wastes; and
- provide information regarding spills, unusual events, and system failures.

Material safety data should be evaluated to identify detrimental characteristics of raw materials being used in the plants. Glycols, chlorine, aerosols, solvents, degreasers, oils, chelating agents, and laboratory reagents are routinely used. The use of all chemicals should be examined on the basis of plant operations, location(s) of use, approximate mass or volume of consumption, reaction potentials and by-products, and waste volumes generated.

Condition after use is important because it is necesssary to identify wastes which are radiologically contaminated versus those which are not. Sources of waste should be reviewed, e.g., shop, hot shop, turbine room, etc. The amounts of the various types of wastes to be disposed must be determined. When possible, it would be useful to know the contents of each container and its form: solid, liquid, liquids absorbed on papers and rags. To achieve waste segregation requires information on discharge volumes, sumps, drains, discharge lines, and collection points. Downstream sampling locations may need to be established for collection of waste for chemical analysis and comparison to RCRA requirements. Finally, such data and information should be evaluated to identify conditions which might lead to worker exposures to hazardous substances.

### Operations and Planning

Planning to evaluate and control radiological hazards is routinely completed and, generally, acknowledged to be a regulatory necessity. This careful attention to detail is sometimes lacking

when the hazard is chemical. A hazard analysis should be completed by answering four questions:

- o What can go wrong and how will it occur?
- o What are the probabilities of occurrences?
- o What are the effects, consequences, and magnitudes?
- o Do the risks need to be reduced and how?

Finally, instructions, procedures and work permits should be prepared as carefully as they have been for radiological hazards.

Activities to be completed include:

- o review available data -- records, inventories, previous monitoring data;
- o set work objectives and determine methods to achieve them;
- o determine personnel requirements, responsibilities and assign tasks;
- o determine the need for operations and health and safety training;
- o determine equipment requirements;
- o plan for emergencies;
- o identify methods to prevent injuries;
- o determine medical surveillance needs;
- o establish required access control; and
- o determine the need for air monitoring.

In addition to radiological procedures, it may be necessary to develop several addressing chemical hazards and protection. These include:

- o prevention of contamination,
- o decontamination of sampling equipment,
- o use of decontamination solutions,
- o disposition of decontamination solutions and any other materials used on equipment, surfaces or systems,
- o flammable liquid storage, dispensing and use,
- o asbestos identification, handling, disposal and environmental air monitoring requirements,
- o minimization of personnel chemical exposures through the appropriate use of administrative work practice procedures consistent with ALARA,
- o personnel protective apparel and equipment use and decontamination,
- o personnel air monitoring protocols for evaluation of chemical and radiological exposures, combustible gases and vapors, toxic materials, and oxygen deficiency,
- o respiratory protection as per 29 CFR 1910.134, ANSI Z88.2, and NUREG-0041,
- o confined space entry and entry into contaminated sumps and tanks,
- o ventilation and other engineering controls,
- o use of biocides, and
- o exothermic reactions in resins.

Finally, RWPs should be modified to ensure inclusion of proper requirements for monitoring, personal protective equipment, access control, equipment, industrial hygiene and quality control to provide proper worker protection against chemical hazards.

Medical Surveillance

The primary goal of an occupational medical program is to detect deleterious health effects so that corrective and therapeutic measures can be taken. In addition to laboratory chemicals, it is not unusual to find asbestos, organic solvents, chelating agents, acids, caustics, oils, PCBs, lead, chromium and mercury at a nuclear plant. Nuclear facility medical programs routinely provide pulmonary function tests and whole body counts but less frequently address other factors. There is a need to evaluate:

- o medical, family and occupational histories,
- o blood-forming, kidney, liver, endocrine and metabolic functions by providing a basic panel of blood and urine counts and chemistries,
- o EKGs,
- o x-rays when working with substances like asbestos, and
- o special bioassay tests, e.g., gamma glutamyl transpetidase (GGTP) to determine liver damage from hydrocarbon exposure.

Emergency Actions and Contacts

Accidents and personnel exposure involving chemicals require expanded emergency planning. Individual responsibilities should be spelled out in a plan which addresses: evacuation/rescue, first aid, decontamination, emergency services and follow-up actions and reports.

A tested communications system should be established with named contacts and telephone numbers for:

- o Fire Department
- o Police/Sheriff
- o Ambulance Services
- o Hospitals
- o Poison Control Centers
- o Physicians
- o CHEMTREC 800-424-9300
- o TOXLINE 301-496-1131

## Personnel Training

General Employee Training (GET) is presented to all employees on a regular basis at nuclear facilities. The major emphasis is on radiation, radiological incidents and radiation protection. Either GET must be expanded or a special course developed and presented to employees at risk of exposure to hazardous chemicals. Topics should include:

- o fundamentals:
  - toxicity,
  - types of exposure/sources of exposure,
- o effects of exposure:
  - physiological and behavioral warning signs,
  - acute, chronic, latent,
  - carcinogenicity,
- o hazardous substances -- exposure information and control:
  - types and concentrations of substances present,
  - determination of which routes of exposure to avoid for the work being completed,
  - specific problems and plant areas to be avoided,
  - control of contamination,
  - medical surveillance,
  - monitoring program,
  - work permits,
  - pertinent regulations,
- o first aid -- identify who has specific responsibilities during a particular work activity,
- o prohibited practices, and
- o emergency procedures and services.

Training sessions should comply with right-to-know and hazard communication regulations. Special requirements may need to be considered such as those listed for asbestos in 29 CFR 1910.1001 and 1926.58.

## Personal Protective Apparel and Equipment

Nuclear plant PCs are adequate for many work activities involving chemicals. However, there may be a need for:

- o chemically resistant clothing,
- o chemical protective gloves and boots,
- o face shields,
- o respirators providing protection for organic vapors, acid gases, dusts, mists and fumes, and asbestos as well as radionuclides, and
- o emergency escape respirators.

Special attention should also be paid to apparel decon stations, personnel decon stations, personal hygiene and fire protection equipment.

## Personnel Monitoring

Monitoring surveys are performed to determine conditions:

- o which may pose an immediate danger to life or health including: explosive atmospheres, oxygen deficiency and levels of highly toxic substances,
- o not immediately obvious or identifiable,
- o which may vary according to the task and its location in the plant, and
- o which may vary as work activities progress.

Direct reading instruments should be utilized when possible and include:

- o combustible gas indicators,
- o oxygen meters,
- o colorimetric indicator tubes to measure concentrations of specific gases and vapors,
- o organic vapor analyzers,
- o ozone meters, and
- o carbon monoxide monitors.

As time permits, or if operations are repetitive, air samples should be collected by a suitable method and analyzed to better determine airborne concentrations of contaminants.

Certain maintenance, outage or changing operations may not be sufficiently repetitive to be able to determine contaminant concentrations in advance of the work. Additional monitoring needs should be based upon factors such as new chemicals are placed in use, different contaminants are present, or workers must work in areas with obvious liquid contamination. Ultimately the monitoring should be used to:

- o select personal protective equipment,
- o identify areas where protection is needed,
- o evaluate potential health effects of exposure, and
- o determine the need for specific medical monitoring.

## CONCLUSION

A team of specialists which includes health physicists, industrial hygienists, chemical engineers, chemists, toxicologists and physicians can solve chemical, radiological and mixed wastes problems at nuclear facilities. When a program is developed with input from other appropriate plant personnel, effective hazard control and health protection programs can be developed.

## BIBLIOGRAPHY


B. S. BOWERMAN, R. E. DAVIS, and B. SISKIND, "Document Review Regarding Hazardous Chemical Characteristics of Low-Level Wastes," NUREG/CR-4433 (1986).

B. S. BOWERMAN, C. R. KEMPF, D. R. MACKENZIE, B. SISKIND, and P. L. PICIULO, "An Analysis of Low-Level Wastes: Review of Hazardous Waste Regulations and Identifications of Radioactive Mixed Wastes," Final Report, NUREG/CR-4406 (1985).

Code of Federal Regulations Title 10 Parts 20 and 61.

Code of Federal Regulations Title 29 Parts 1910 and 1926.

Code of Federal Regulations Title 40 Parts 261 and 262.

National Institute for Occupational Safety and Health, Occupational Safety and Health Administration, U.S. Coast Guard, and U.S. Environmental Protection Agency, "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities," DHHS (NIOSH) Publication No. 85-115 (1985).

U.S. Department of Energy, "Environmental Protection, Safety, and Health Protection Program for DOE Operations," DOE 5480.1A.

U.S. Environmental Protection Agency, "Standard Operating Safety Guides" (1984).

U.S. Environmental Protection Agency," Technical Methods for Investigating Sites Containing Hazardous Substances," Technical Monograph Series 1-29 (1981).