

Hazardous Waste Management

UAB/JCDH Environmental Health
Specialists Certification Program

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Module 1

Module #1 Outline

1. A little  History Lesson: Hazardous Waste
2. Federal Environmental Laws
3. Hazardous Characteristics

A little History never hurts ...

US Hazardous Waste Timeline:

- Pre 1800s: Widespread agricultural communities – “natural” wastes.
- 1800s: Industrial Revolution
 - Concentrated discharge of traditional wastes.
- 1900s: US entered “Petroleum Age”
 - kerosene & other petroleum distillates used as solvents & fuels.
- 1930s - 50s: Synthetic chemicals
 - Petroleum era – Indestructible & toxic materials.
- Up to 1960s: Earth was abused; WHY?:
 - Little knowledge of the effects of dumping waste (chemicals into air, land and waterways) on the environment.
 - No legislation to protect public health.
 - Assumed that the earth could assimilate everything.

A little History never hurts ...

Disposal Practices: Cheapest / Convenient

- On/off site drum storage & burial in shallow trenches (pits);
- Ponds / Lagoons;
- Direct surface discharge to ground or waterbody;
- UST’s (underground storage tanks);
- Sanitary Landfill “Unlined”;
- Uncontrolled Incineration;
- Midnight Dumping.



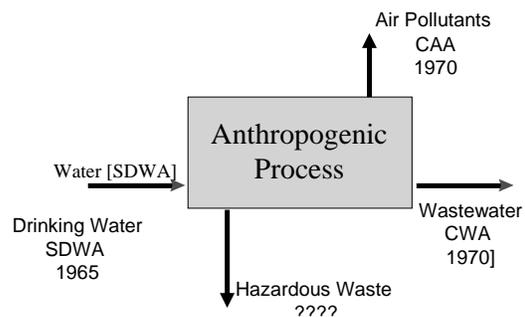
- **No Federal Regulation on HW disposal until 1976.**

Landmark Publication:

“If we are going to live so intimately with these chemicals - eating and drinking them, taking them into the very marrow of our bones - we had better know something about their nature and their power”

Rachel Carson
The Silent Spring, 1962

Emerging Environmental Laws:



**Environmental Laws:
Hazardous Wastes**

Resource Conservation and Recovery Act (RCRA)
~1976

- Extension of the "Solid Waste Disposal Act" of 1965.
- First Environmental law pertaining to the identification / disposal of Hazardous Wastes.
- Defined "Hazardous Wastes (HW)".
- Mandated governmental control of HW from the point of generation/origin to ultimate disposal (Cradle to Grave Manifest).

Pronounced: "Rick- Ra"

**Environmental Laws:
Hazardous Wastes**

Toxic Substances Control Act (TSCA) ~1976

- Regulated the production, use and disposal of chemical substances that presented a "unreasonable risk" of injury to human health or the environment.
- Required manufactures to disclose new chemicals or new uses for chemicals.
- Required records and reports on HW utilization.

Pronounced: "Tas-Ka"

Let's Play:

"Risk or No Risk"

- Cigarette Smoker Risk - cancer/heart disease
- Eating Peanut Butter Risk - poisoning Aflatoxin
- Drinking Diet Soda Risk - cancer ~saccharin
- Eating Steak Risk - cancer ~pyrobenzenes
- Drinking Tap Water Risk - cancer from TTHMs (Trihalomethanes)

Environmental Risk:

EPA sets standards to control our risk of adverse health effects from exposure to Hazardous chemicals.

EPA Acceptable Risk:

- 10^{-6} to 10^{-4} excess lifetime risk (0.0001% to 0.01%).
- HW site cleanup often to risk factor of 10^{-4}
 - i.e. over a lifetime one in 100,000 people will experience adverse effects.
- Called De-Minimus Risk (many daily activities carry greater risks).

**Environmental Laws:
Hazardous Wastes**

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

- The "Superfund" passed by Congress Dec. 1980.
- Created **tax** on the chemical and petroleum industries:
 1. Identify and respond to sites from which releases of hazardous substances had or could occur;
 2. Ensure they are cleaned up by responsible parties or through government funding; and
 3. Evaluate damages to natural resources.

Pronounced: "Cir-ka-la"

Main Components of CERCLA:

- 1. Liability**
 - System for Responsible Parties to clean up or pay for clean-up.
- 2. NCP (National Contingency Plan)**
 - Mechanism for determining appropriate action to take at identified HW sites.
- 3. NPL (National Priorities List)**
 - Priority list of sites for targeted remediation (Bad 1st).
- 4. Superfund**
 - Fund to pay for remedial action at a site where no "Responsible Parties" found / unwilling to contribute.

Environmental Laws:

Hazardous Wastes

Superfund Amendments and Reauthorization Act (SARA) ~ 1986.

- The first mandatory governmental program requiring chemical emergency planning at the state and local level.
- SARA was an extension of CERCLA that established remediation standards and increased funding (\$8.6 Billion Trust Fund) to implement the program.
- Emergency Planning and Community Right to Know Act (EPCRA) was established in 1986 to provide the public with knowledge about the chemical hazards in their area. (Title III of SARA)

Acronyms for Hazardous Waste

Modules: 40CFR 260.10

- **HW** Hazardous Waste
- **CERCLA** Comprehensive Environmental Response Compensation & Liability Act (1980)
- **EPA** US Environmental Protection Agency
- **EPCRA** Emergency Planning and Community Right to Know Act
- **RCRA** Resource Conservation and Recovery Act (1976)
- **SARA** Superfund Amendments and Reauthorization Act (1986)
- **TSCA** Toxic Substance Control Act (1976)
- **TSDF** Treatment Storage & Disposal Facility
- **RP** Responsible Party

Summary Attitudes to HW Pollution:

Up to 1960s: Ignorance Phase

- “Dilution is the solution to pollution”
- Midnight dumpers - take it out back.
- Out of sight is out of mind.

1960-70s: The Realization Phase

- Awakening of the environmental conscience:
 - “What have we done to our environment”.

1970-90s: The Regulation Phase

- Treatment is the solution.

2000s: The Minimization & Environmental Standards Phase

- ***Non-production is the solution***

Popular HW Acronyms:

- **NIMBY**
 - Not in my backyard
- **BANANA**
 - Build absolutely nothing anywhere near anybody
- **NIMTO**
 - Not in my term of office



What makes something “Hazardous”?

- A deceptively complex question.
- Everything is relative: Our view of a hazard substance can vary widely over time.
- Example:
 - Asbestos was superior insulator that could lead to better control of HVAC environments, but is now known to cause severe health complications.
- The answer to this question took the EPA **4** years.

Definition of a Hazardous Waste:

A solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical or infectious characteristics may:

- 1) Cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible or incapacitating reversible illness.

or

- 2) Pose substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of or otherwise managed

Regulatory Definition of a HW:

1. It exhibits a Hazardous Characteristic:
 - 40CFR 261 subpart C
2. It is listed as a RCRA Hazardous Chemical:
 - 40CFR 261 subpart D

Characteristic Hazardous Wastes:

What properties or qualities of the waste cause the waste to be dangerous.

1. Ignitability
2. Corrosivity
3. Reactivity
4. Toxicity



Characteristic of Ignitability:

- A solid waste exhibits the characteristic of ignitability if a representative sample of the waste is:
 - A liquid having a flashpoint of less than 140 degrees F (60°C).
 - A non liquid that causes fire through friction, absorption of moisture, or spontaneous chemical changes and when ignited, burns so vigorously and persistently it creates a hazard.
 - An ignitable compressed gas.
 - An oxidizer.
- Ignitable Wastes Common in Industry
 - Wash solvents
 - Methyl ethyl ketone (MEK)
 - Solvent-based coatings

Characteristic of Corrosivity:

- A solid waste exhibits the characteristic of corrosivity if a representative sample of the waste is:
 - Aqueous, with a pH less than or equal to 2.0, or greater than or equal to 12.5.
 - Liquid and corrodes steel at a rate greater than 6.35mm per year when applying a National Association of Corrosion Engineers Standard Test Method.
- Corrosive Wastes Common in Industry
 - Acids
 - Waste battery acid
 - Alkaline cleaners

Characteristic of Reactivity:

- A solid waste exhibits the characteristic of reactivity if a representative sample of the waste:
 - Is normally unstable and undergoes violent change;
 - Reacts violently with water;
 - Forms potentially explosive mixtures with water;
 - Generates toxic gases, vapors, or fumes when mixed with water.
- Reactive Wastes Common in Industry
 - Waste bleaches and Oxidizers

Characteristic of Toxicity:

- A waste exhibits the characteristic of toxicity if using the Toxicity Characteristic Leaching Procedure (TCLP), the extract from a representative sample of the waste contains any of the contaminants listed at the concentration equal to or greater than the respective value given in that table
- Developed due to concern over leachability of toxins from landfills.
- Toxic Wastes Common in Industry
 - process waste water
 - clean-up solvents
 - inks, surface coating materials

Something to Think About?

- What industries in my area are producing Hazardous Wastes?
- Where does that waste go?



Additional Resources:

- *EPA Hazardous Wastes*
 - www.epa.gov/osw/hazwaste.htm
 - www.epa.gov/region4/waste/index.htm
 - www.epa.gov/tri/
- J.A. Salvato (et. al.), *Environmental Engineering*, 5th Edition, J. Wiley Publishers, 2003.
 - NEHA Suggested Text
- Gilbert Masters, *Introduction to Environmental Engineering and Science*, 3rd Edition, Prentice-Hall, Inc., 2007.

End Module #1