Environment, Safety and Health Bulletin

Gas Buildup in Drums

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***Special Operations Reports** are issued to initiate management actions in response to events whose subject matter represents significant Departmental safety concerns.*

***Environment, Safety and Health (ES&H) Alerts** are issued to initiate immediate action on potentially significant safety issues.*

***Environment, Safety and Health (ES&H) Bulletins** are issued to share information and recommend actions on potential safety issues.*

***Safety Advisories** are issued to provide information to the DOE Complex on potentially significant safety or health issues.*

Purpose

This Bulletin provides information on a safety concern that may impact operations at Department of Energy (DOE) facilities. Specifically, the concern is the safe handling, storing, venting, and opening of drums that may be pressurized or may contain flammable vapors.

Background

Potential causes of drum overpressurization include:

- Radiolysis of water or organic materials.
- Chemical reactions such as oxidation of organic material or reaction of metals with water and acids.
- Decomposition of waste by anaerobic bacteria.
- Change in altitude or temperature.
- Exposure of volatile liquids to sun or heat.

DOE records show that there have been 36 safety incidents involving gas buildup in drums over the past 5 years. In one-third of these incidents, the lid erupted or the drum ruptured, releasing some of the contents. The remaining incidents resulted from an accumulation of flammable hydrogen or methane gas in the drum headspace or overpressurization from unvented or inadequately vented containers.

What are the Hazards?

An unexpected lid ejection could strike a worker, resulting in serious injury. Workers could be exposed to the released drum contents, or flammable or explosive vapors could ignite. Subjective tests for drum safety, such as looking for the absence of deformation and bulging or using the two-hand flex test, where a worker presses both hands on a drum and concludes the drum pressure to be safe if the lid flexes downward, are not reliable indicators of safe pressurization.

Controlling The Hazards

- Know the materials or wastes that are being stored.
- Do not mix incompatible materials or wastes.
- Consult Material Safety Data Sheets or Waste Profile Forms.
- Ensure that stored materials are compatible with the containers.
- Avoid situations (e.g., temperature changes) that can promote pressurization and generation of flammable vapors.
- Material handlers and drum users should approach, handle, and open all sealed drums as if they were pressurized.
- Assume that "empty" drums can become sufficiently pressurized to cause injury.
- Lid-restraining safety devices should be used routinely when opening drums or other containers.
- When using a restraining device to open a drum lid, allow internal gas to escape slowly before fully removing the lid.
- Follow applicable facility procedures for venting hazardous waste containers when required under 40 CFR Parts 264 and 265, Subparts AA, BB, or CC.
- Always consider the potential for a fire when planning work involving drums that may contain flammable or explosive gases.
- Avoid potential friction or impact sparks, static electricity, and self-ignition and ensure that drums and containers are properly grounded when they could contain explosive concentrations of gases.
- Use non-sparking venting devices to help prevent ignition of flammable vapors.
- If possible, handle the drums remotely or isolate them from personnel.
- Immediately evacuate the area when bulging or smoking drums are identified and notify your supervisor and emergency response or fire department.
- Follow the guidance in the DOE fire safety directives (10 CFR 851; DOE O 420.1B, *Facility Safety*; DOE G 440.1-5, *Implementation Guide for Fire Safety Program*) when handling drums and containers of hazardous material or waste.

Additional Sources of Information

- Your Safety and Health Office
  Information on the Web on related operating experience, lessons learned, and DOE directives:

  http://www.eh.doe.gov/paa/analysis.html

  http://www.directives.doe.gov/directives/current.html#number

Summary

Prevent drums and containers from becoming pressurized whenever possible. If pressurized drums or containers are found, take the necessary steps to handle them safely.

If you have any questions, please contact Dr. Bill McArthur by telephone at 301-903-9674 or by e-mail at bill.mcarthur@eh.doe.gov.

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PREVENT EVENTS
Learning from Industry Experience

PREVENT EVENTS is intended for use by personnel during morning meetings, pre-job briefings, and work unit meetings to communicate key industry experience.

Management:

1. What training have we provided our workers on working with drums and other containers?
2. Do we have written procedures for handling drums and other containers?
3. Do we have a program of routinely inspecting drums and other containers for proper venting?
4. Does all work planning for handling drums and containers on-site take into account the possibility of gas buildup and pressurization?
5. Have we made available to our workforce the proper lid-restraining equipment and non-sparking venting devices?
6. When venting hazardous waste drums and containers, does our workforce follow applicable procedures under 40 CFR Parts 264 and 265, Subparts AA, BB, or CC?

Supervisors and Workers:

1. Have the contents of the drums or containers been characterized?
2. What potential hazards could we encounter in handling these drums and containers?
3. Do we looking for situations, such as heat exposure and container agitation, that can lead to container pressurization or production of flammable vapors?
4. How do we avoid creating friction sparks or static discharges that could ignite the flammable gas in the drum headspace?
5. Is a grounding strip or connector readily available in case the drums have not been grounded?
6. Do we have lid-restraining and non-sparking venting devices?
7. Under what conditions do we handle drums and other containers remotely?