JUNE 2025 HEALTH, SAFETY AND ENVIRONMENT OFFICE

SAFETY ALERT

CONSEQUENCES OF POOR CHEMICAL WASTE MANAGEMENT: LESSONS FROM TWO CRITICAL INCIDENTS

Two similar incidents involved the improper handling of chemical waste occurred in the same week: one resulted in a serious chemical splash, while the other was discovered in time to prevent a burst. These incidents highlight the critical importance of effective chemical waste management. Both incidents reveal that chemical waste producers failed to comply with local chemical waste regulations, neglected chemical compatibility, and failed to conduct proper risk assessments for their experiments.

In the first incident, bursting occurred due to the mixing of incompatible materials within a Halogenated solvent waste container. Pressure buildup in the tightly capped container caused unknown materials to expel and splash throughout the university's chemical waste store. As a result, the facility is now suspended from normal use, necessitating further decontamination by authorized personnel. The total loss exceeds one hundred and fifty thousand dollars.

SOME CRITICAL LESSONS LEARNED AND RECOMMENDATIONS

Insufficient/Wrong Information on the Chemical Waste Log Sheet

Each chemical waste container comes with a separate chemical waste log sheet that includes a unique traceable number assigned by HSEO. This requirement fulfils the legal obligations outlined in Cap 354C, Waste Disposal (Chemical Waste) (General) Regulation, Part IV: Storage of Chemical Waste.

Chemical waste producers must ensure proper packaging, labelling, and storage of chemical waste before transporting it to licensed disposal facilities. Every waste item added to the container must be accurately logged. The completed log sheet must accompany the container during collection by the Chemical Waste Treatment Centre (CWTC) contractor, who will refuse to collect the container without a legible log sheet.

The Hong Kong University of Science & Technology

Chemical Waste Log Sheet

Supervisor/ PI: CHAN
Department: HSEO
Location: 6001
Contact Person: LAM, Tai Man
Contact Number: 1234

Waste Type: Halogenated Solvent
HSEO No.: 4567-HSEO-LB-(6001)-05-19-HO-1

Date (DD/MM/YY)	Name of Reactant/ Product/ Waste (Full Name in Block Letter)	Quantity	Producer's Name	Phone No.
20/5/2025	Chloroform	5L	Mary	1234
21/5/2025	Dichloromethane	10L	Mary	1234

The unique traceable number on the waste container must match the number on the corresponding chemical waste log sheet

SAFETY ALERT

In this incident, dark brown sticky substances and clear oily liquids were splashed throughout the storage area.

The submitted chemical waste log sheet did not accurately reflect the actual contents and the date was also incorrect. Following the incident, the waste producer was unable to identify most of the unknown materials inside the container.

Chemical Waste Log Sheet

Supervisor/ PI: [redacted]
Department: [redacted]
Location: [redacted]
Contact Person: [redacted]
Contact Number: [redacted]13

Waste Type: Halogenated Solvent
HSEO No.: 6308-[redacted]-05-06-HO-3

Date (DD/MM/YY)	Name of Reactant/ Product/ Waste (Full Name in Block Letter)	Quantity	Producer's Name	Phone No.
5/2024	Dichloromethane Hexane	2L	ZH	

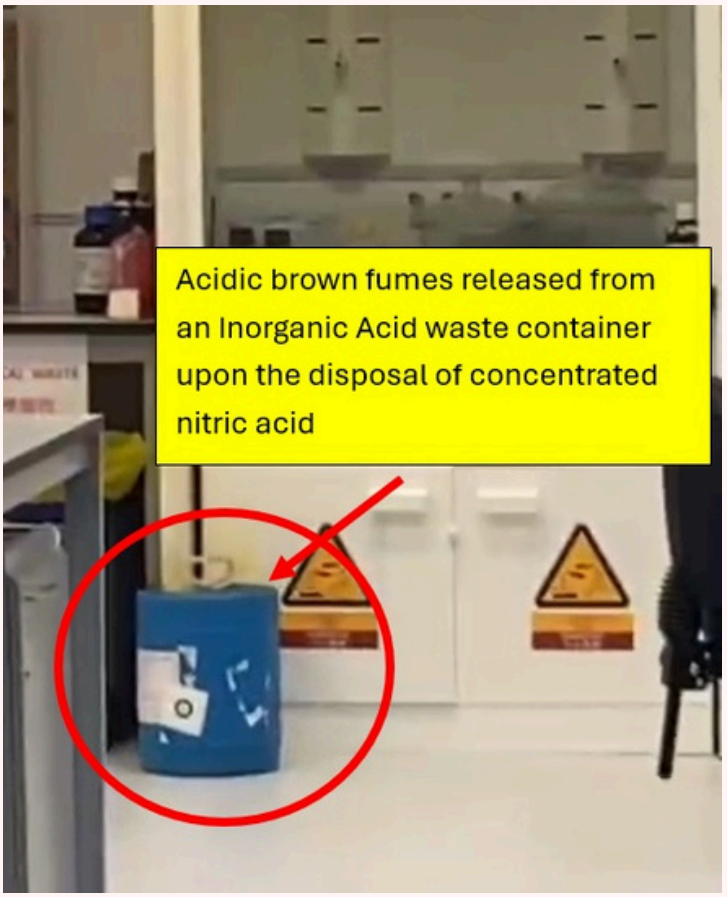
An incorrect date of 5/2024 was recorded

The recorded entries for Dichloromethane and Hexane do not accurately reflect the actual contents

Providing accurate details about chemical waste not only fulfills legal requirements but also helps prevent accidents/incidents caused by the mixing of incompatible materials, which was the root cause of this bursting of the chemical waste container.

Neglecting the Chemical Compatibility

Accidents/incidents resulting from improper chemical waste management are common. In recent years, three related cases have led to the evacuation of laboratories for chemical spill treatment. A similar incident happened just a week after the Halogenated solvent waste container burst. An inflating Metal Solution waste container was discovered in the university's backup waste store, prompting immediate treatment to prevent a burst. Unwanted side reactions in a waste container often occur due to the improper disposal of strong oxidizing agents (such as Aqua Regia and sodium hypochlorite solution), concentrated acids (like sulfuric acid and nitric acid), and water-reactive substances (such as sodium metal and Tin (IV) chloride). These reactions can result in the release of toxic or corrosive fumes and may even cause fires.



SAFETY ALERT

Chemical wastes containing incompatible substances must be treated before disposal using methods such as dilution, neutralization, or redox reactions. All chemical waste producers should be familiar with the appropriate disposal methods, especially since these incidents involved four different departments in our university. HSEO provides specialized chemical waste containers, including those for oxidizers, spent alkaline materials, and spent inorganic acids, to ensure the safe disposal of concentrated corrosive materials.

Chemical Waste Storage

This incident highlights the critical importance of proper storage for chemical waste containers, as the burst occurred in the university's chemical waste store just two days after the containers were retrieved from the user. Evidence suggests that the incident involved the disposal of untreated HBr, Br_2, and sodium carbonate in the container. The slow buildup of carbon dioxide in the tightly capped container ultimately led to the burst. In addition, another container from the same research group was found to be inflating during the investigation.

Emergency Response

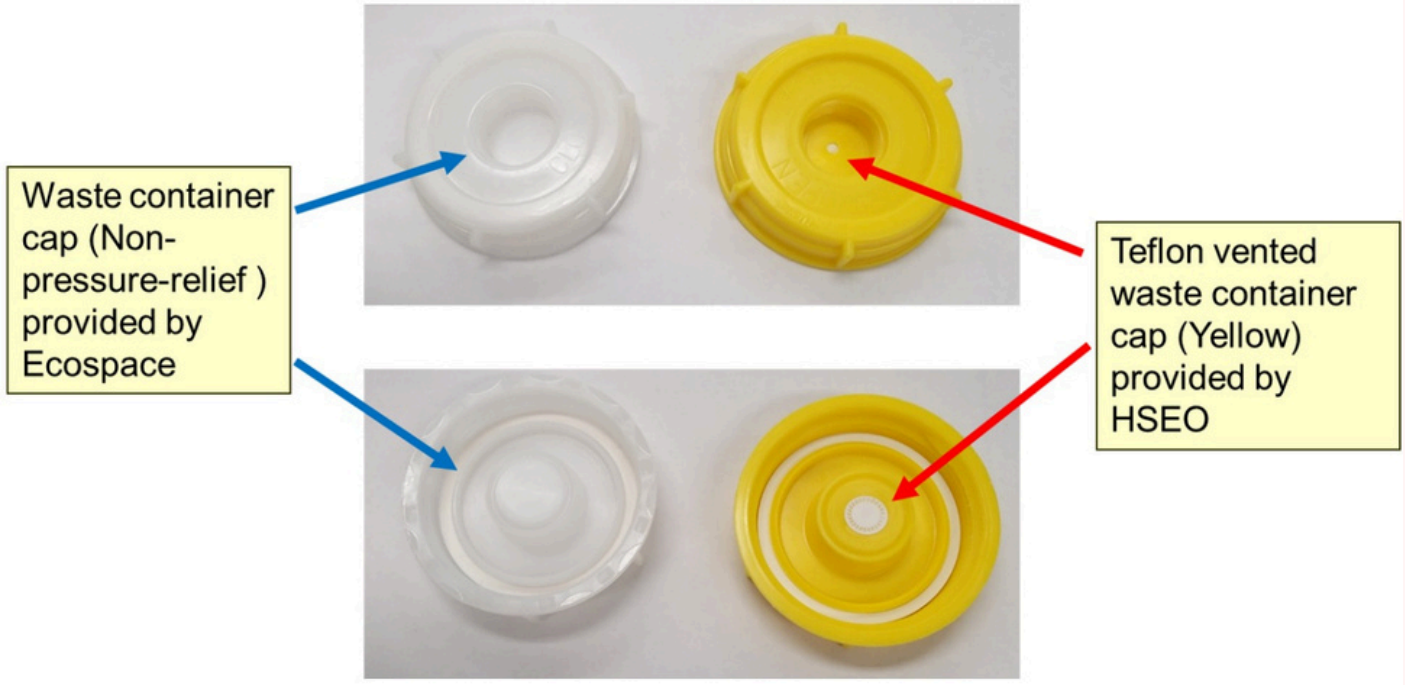
In this incident, the HSEO emergency response team was promptly equipped with self-contained breathing apparatus (SCBA) to carry out immediate treatment to the inflating waste container and prevent a second burst.

SAFETY ALERT

Pressure-relief Cap for Chemical Waste Container with Potential Gas/Vapor Generation Risks

The non-pressure-relief waste container cap (White) provided by Ecospace is designed to securely seal waste containers without allowing for gas release, making it suitable for waste that does not generate pressure or fumes. In contrast, the Teflon vented waste container cap (Yellow) provided by HSEO features a venting mechanism that allows the generated gases to release safely, preventing pressure buildup in the container. This cap is ideal for wastes that may generate gases during storage before being collected by the chemical waste collection team.

Lab users can submit requests for Teflon vented waste container caps through the HSEO webpage under "Request for Chemical Waste Collection".



The Importance of Risk Assessment

Risk assessment for experiments should include proper disposal procedures for chemical wastes. Waste producers must ensure that chemical wastes are not mixed with other wastes in the same storage area or within the same container if such mixing could lead to dangerous consequences, as outlined in the Code of Practice on the Packaging, Labelling, and Storage of Chemical Waste.

SAFETY ALERT

In this incident, a risk assessment should have been conducted before starting the experiment by identifying:

1. The potential hazards associated with mixing incompatible materials, such as carbonates in an acidic medium.
2. The proper methods for deactivating reactive materials before disposal, such as bromine and Br_2.
3. The selection of appropriate waste containers, such as those designated for inorganic acids and acidic oxidizers.
4. The need for a compatibility test if there is any possibility of a reaction between the new waste and existing waste in the container.
5. The potential risk of gas generation upon mixing wastes; in such cases, the waste container should not be capped tightly, and a pressure-relief cap should be used. Never return a filled waste container with potential over-pressure hazards to the chemical waste collection team.

References

Code of practice on the packaging, labelling and storage of chemical wastes, EPD (**link**)

Chapter 16 of the HKUST Safety and Environmental Protection Manual : Disposal of Hazardous Materials and Items under Regulatory Control (**link**)

HSEO Health and Safety Posters: HAZARDOUS WASTE MANAGEMENT (can click the posters to access the link)

QR CODES

1. CHEMICAL WASTE COMPATIBILITY TEST

2. CHEMICAL WASTE CONTAINER PROPER SELECTION GUIDE

3. PROPER DISPOSAL OF CHEMICAL WASTE

1

2

3