



< Fire and explosion protection >

Container Cleaning



IAMC Toolkit

Innovative approaches for the Sound Management of Chemicals
and Chemical Waste

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Introduction

Residues and vapors confined in empty containers may create potentially explosive atmospheres when combined with air.

This presentation is a specific introduction for the user to container cleaning techniques to minimize the risks while implementing it.

Hazard Management

1. Risk identification and safety

11. Chemical classification and labelling

12. Risk assessment

13. Safety rules

14. Personal protective equipment

15. Skin protection

16. Emergency escape routes

17. Handling of solvents, acids and bases

18. Safety in gas tank handling

2. Transport and storage

21. Internal transport of chemicals

22. Internal pedestrian routes

23. Storage

3. Fire and explosion protection

31. Fire protection

32. Fire protection in welding and cutting operations

33. Explosion protection

34. Container cleaning

4. Emergency response

41. Emergency response plan

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 - Container cleaning
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Context

Context

- When emptying containers of flammable liquids, **residues and vapours** subsist. They can **be hazardous to the staff's health** and can sometimes form **explosive mixtures** when combined with **air**.
- **When does an explosion occur?**

Potentially explosive atmosphere



Effective source of ignition

- **Flames** (torch, matches, etc.)
- **Sparks** (electricity, cutting, grinding, etc.)
- **High surface temperatures** (equal and superior to 220 °C)

Context

- Example of **flammable substances**:
 - Gasoline (7g)
 - Acetone (11g)
 - Toluene (10g)
 - Oil
 - Alcohols
 - Methylated spirits (13g)
 - Nitrodilutant (10g)
 - Varnish



Source: United Nations

Small quantities (as indicated above) are sufficient to cause an explosion hazard. For example, for a 200-litre container, these quantities are sufficient to trigger an explosion.

- Example of **hazardous volatile substances**:
 - Chlorine
 - Formaldehyde
 - Alcohols
 - Agrochemicals (partly)

The formation of volatile substances depends on the ambient temperature. Storage conditions influence the risk!

Work on Used Containers

Work on Used Containers

- It is not recommended to repair or modify used containers since the explosion hazard is far too high.
- Work generating sparks or flames should never be performed on used containers.
- Containers must be handled in an enclosed area, adapted to the specific cleaning work (e.g. fluid containment reservoirs in case of spills).

Work on Used Containers

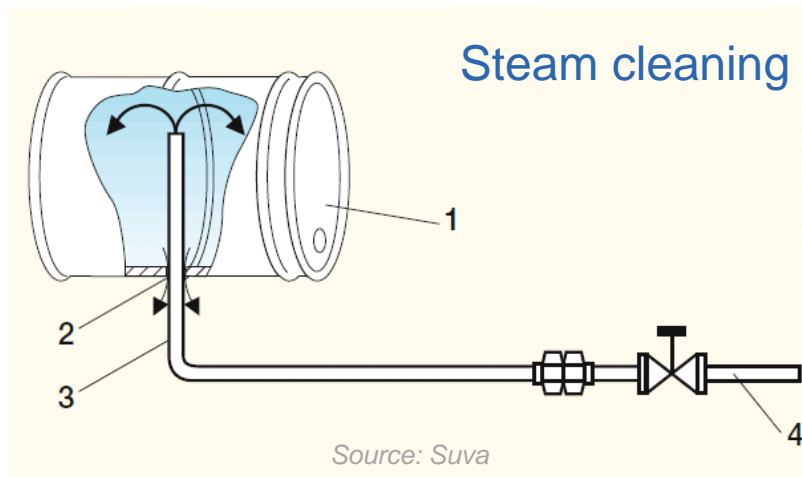
- If work on used containers has to be performed despite the explosion hazard, the following precautions should be taken:
 - **A) Empty the container**
 - **B) 1. Clean the container** or **2. Reduce the volume of air** in the container before performing any work likely to generate sparks or flames.

When re-using an empty container, the previous content and the cleaning method must be indicated or available. Otherwise, the quality of the new product to be contained may be compromised.

Prevention Measures

Prevention Measures

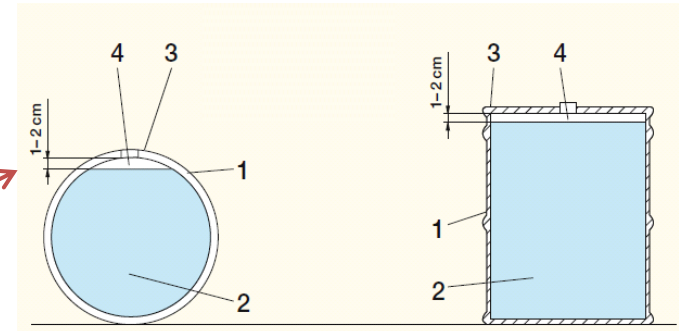
- Two ways of **container cleaning**:
 - Repeated and intensive rinsing with commercial cleaning products
 - Steam cleaning for a minimum of ten minutes: The vapours exiting the container should be safely evacuated. Additionally, appropriate ventilation has to be ensured during the entire welding and cutting activities to eliminate remaining vapours.



1. Container
2. Plug
3. Supply tube
4. Pipe

Prevention Measures

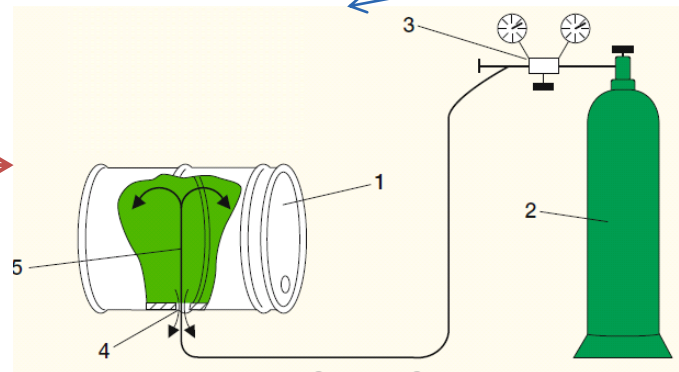
- Two ways of **reducing the air volume in a container**:
 - Fill the **container with water** (only a small volume of air remains where the work is performed)
 - Fill the **container with inert gas**, such as nitrogen or carbonic gas. The vapours exiting the container should be safely evacuated.



Source: Suva

1. Container
2. Water
3. Welding area
4. Free space with ventilation opening

1. Container
2. Nitrogen bottle
3. Pressure reducer
4. Plug
5. Supply tube



Source: Suva

Preventing the Inhalation Risk

How to Prevent the Inhalation Risk

- **Get informed** on the potential volatilization of your product (information should be available and visible).
- Follow the indications on the **labels and notes** on the container.
- **Never lean** over the container while opening it.
- Some remaining gases are **heavier than air**. Therefore avoid locating cleaning areas in the basement (potential accumulation of hazardous gases).

Preventing Environmental Risks

How to Prevent Latent Environmental Risks

- As long as your container is not entirely clean, **it cannot be disposed of as normal waste** because it still contains small amounts of chemicals.
- If accumulated in the environment, uncleaned containers or the remnants of their content can **contaminate the site.**

Source: Suva

Key messages

- A potentially explosive atmosphere coupled with a source of ignition has high probability to create an explosion.
- Small quantities of substances are sufficient to cause an explosion hazard
- Air volume in a container must be reduce to reduce the risk.

Sources

Sources

- CSD Engineers, Switzerland/ISSPPRO, Germany, 2015
- Suva: Attention la mort guette dans les récipients vides!, Switzerland, 1993

Images

- Suva: Attention la mort guette dans les récipients vides!, Switzerland, 1993
- United Nations: Globally Harmonized System of Classification and Labelling of Chemicals (GHS), 2003, last revision 2013

Disclaimer

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