Safety Information

Prepared by the Safety Advisory Council

Safety Info 27/11/E

Operation of Transportable Vacuum Insulated Containers for Industrial and Medical Gases

Summary

EIGA has recently received reports of serious incidents that have resulted in the rupture of transportable vacuum insulated containers at our filling stations and at user premises. Analysis of these incidents indicates the root causes as failure to apply appropriate engineering standards, poor operating practice, lack of periodic maintenance and inspection of safety devices and other important operating controls.

This Safety Information is intended to raise awareness of these serious incidents and to provide the basic recommendations and rules to safely operate these containers at our filling stations and user premises.

Photo 1

Photo 2

In the first case, while being carried on a customer truck a 160 litre transportable cryogenic container in Oxygen service suffered a leak from the neck of the inner vessel. The container ruptured resulting in serious damage to the cab and chassis of the truck (Photo 1).

In the second case a 196 litre transportable cryogenic container in Nitrogen service ruptured at a cylinder filling station while stored in the storage area (Photo 2), resulting in serious damage to the building and equipment.

In both cases, the relief devices failed to operate properly - either the safety valves were blocked due to corrosion and/or being jammed by foreign body or the bursting disc didn't operate because it was of the wrong specification (unauthorised customer modification). These hazardous conditions were not identified due to inadequate maintenance and inspection.

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A transportable vacuum insulated container

Typical container size in the industry varies from 100 to 1,000 litre water capacity. It is estimated that there are more than 1,000,000 of these containers in use worldwide.

Typical design and safety features are shown in this example (photo 3):

Photo 3

Capacity:	196 litre water capacity giving circa 180 litres of liquid Nitrogen
Insulation:	Vacuum insulated.
Working pressure:	Nominal max. pressure 15.9 barg.
Test pressure:	22 barg.
Trycock:	Set for filling to 95% capacity.
Safety devices:	Dual safety relief valves or safety relief valve and bursting disc

These containers are designed for liquid and gas withdrawal. They are fitted with a regulated pressure raising circuit and equipped with a pressure gauge and a level indicator.

Known risks

- Non standard couplings on the liquid or gas connections or unauthorized modifications to these couplings
- Safety devices such as the pressure relief valve(s) and/or bursting disc not being maintained or inspected
- Unauthorised design modification to fulfil individual customer requirements
- Unauthorised modifications carried out by the customer
- Containers are frequently rented out to a third party (customer) where the responsibility for periodic inspection and maintenance is unclear
- Transfilling operations from large vessels to these smaller containers done by non competent personnel
- Container contamination at customer premises
- No reporting to the owner of damage that has occurred on rented vessel at customer premises or during transport

Recommendations for safe operation

Requirements for the design, use and handling of this equipment are defined in the European Standard EN 1251-1/2/3 “Cryogenic vessels — Transportable vacuum insulated vessels of not more than 1000 litres volume”. Gas Companies and customers have certain duties to ensure that these containers comply with these requirements.

Key requirements include the following.

- Only containers that comply with the relevant regulations and legislation e.g. ADR (if the containers are transported full) and TPED shall be used in the European Union countries. New containers may be PI or CE marked.
- Pre-fill check procedures shall be implemented wherever the containers are filled. These procedures shall be carried out by a trained and competent operator and in order to check as a minimum the date of the last inspection, product and withdrawal instruction labels, general condition, operation of manual valves, protective devices, outlet connection(s), pressure gauge and level indicator.
    - The check of the protective devices, safety valve(s),bursting disc(s) should include checking for external damage, and ensuring the outlet is not plugged or restricted, if the safety valve is fitted with a lever this may be used to prove the safety valve is operational,
- In the case of filling by weight, maximum permissible filling weights shall be observed
- Pressure relief devices shall be changed or tested at intervals in accordance with the technical specification of the manufacturer and at a period not exceeding five years. The pressure relief device shall only be changed or tested by an appointed competent person such as an EIGA company employee who has been trained to carry out the task. Test results shall be documented.

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- At intervals not exceeding 10 years a periodic inspection shall include an external visual inspection, leak test and vacuum check which shall be carried out by an appointed competent person.
- The owner of the container shall retain records of any periodic inspections, repairs or modification and any corrective actions.
- Manufacturer's original sized and fitted safety devices shall not be modified or replaced unless there has been a management of change (engineering modification) procedure applied.

References

EIGA IGC Doc. 93 Safety Features of Portable Cryogenic Liquid Containers for Industrial and Medical Gases.

BCGA CP27 Transportable Vacuum Insulated Containers of not more than 1000 litre volume. Revision 1:2004

EN 1251-1/2/3 Cryogenic vessels – Transportable vacuum insulated vessels of not more than 1000 litres.

European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR).

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