EIGA Safety Newsletter

Prepared by the Safety Advisory Group SAG NL 89/10/E

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Typical Tow-Away incident outcome - damaged equipment

Typical cylinder bundle/pallet tow-away incidents

A **nitrogen** bundle was removed from the filling rack with a fork lift truck while still connected. The fill hose came apart, but was retained by the intact safety cable.

A bundle containing a **non flammable gas mixture** was removed with a fork lift truck whilst it was still connected. The filling installation consisted of 4 bundles in a row and the FLT was only able to approach from one side. The fork lift driver wanted to remove the first bundle in order to access to the two bundles behind that were already filled. The consequence was damage to the hose connection and pipe**.**

A connected filling hose failed during removal of a **hydrogen** bundle that had just been filled. The escaping hydrogen ignited. No personnel were injured but fire caused damage to the filling building and equipment.

At the end of filling operations in a **hydrogen** bundle station, a worker started to remove a bundle using a fork lift truck without first disconnecting the flexible hydrogen filling hose. The hose ruptured resulting in a release of hydrogen and fire causing damage to the bundles.

During transfer from filling area to storage, a worker with a fork lift removed a drum of **ammonia** still connected via a flexible hose to the filling rack, resulting in the release of ammonia.

A pigtail connector nut broke during **oxygen** cylinder filling. The pressure was 210 bar. The investigation was inconclusive but found the most probable cause was removing the pallet with some pigtails still connected**.**

A driver attempted to remove a pallet of **acetylene** cylinders with a fork lift truck. The filling hoses were still fastened and under pressure with the compressors running. Pipework was bent and filling hoses destroyed.

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A fork lift truck operator tried to move a bundle filled with 220 bar **oxygen** before the filling hose was disconnected, the bundle valve was shut. The filling manifold and hose were damaged.

A fork lift driver had to replace an empty **helium** bundle on a switchover system with two bundles. By mistake the driver removed the connected bundle rather than the disconnected one with the fork lift truck.

AND MANY MORE SIMILAR INCIDENTS

What is a cylinder bundle/pallet tow-away Incident?

The expression "**Tow-Away**" is often associated with incidents involving bulk tankers, but is used here for incidents when cylinders in bundles or pallets are moved by motorized vehicles, usually a fork lift truck, while they are still connected to the gas filling system.

This kind of incident does not always result in injuries or product release, but these tow-away incidents do cause damage to the filling equipment, hoses and connections – sometimes unseen - and could have much more serious consequences.

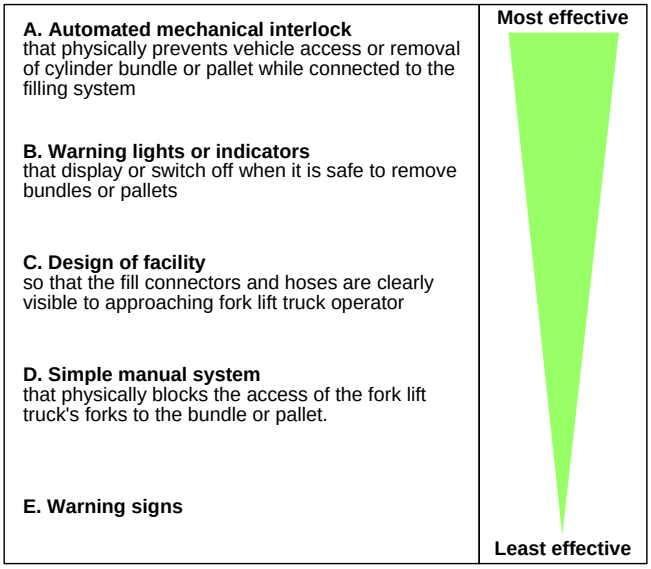
These cylinder bundle or pallet tow-aways are one of the most common incidents in the gas cylinder industry and sometimes become accepted as a "normal" every day occurrence, which is not always reported.

This Safety Newsletter describes some possible measures to help prevent the tow-away of cylinder bundles or pallets. It applies to all facilities where cylinders on pallets or in bundles are moved by mechanical means, either pedestrian operated pallet trucks, or motorised vehicles such as fork lift trucks.

Tow-Away Prevention (Safety measures)

To avoid "tow-away" incidents in the future and to improve safety performance in gas companies, SAG recommends that at least one or preferably a combination of the possible preventive measures described below is used.

Preventive Measures shall involve either



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Cylinder bundle or pallet tow-away incidents can be completely eliminated in facilities with effective automated mechanical interlocks (A).

Installation of automatic indicators (B), or facilities designed so that where the fill connectors can be clearly seen by FLT drivers (C) together with operator training can significantly reduce the likelihood of such incidents.

Introducing a manual system (D), again with proper training of all involved operators and drivers, is a simple and cost effective solution.

In all arrangements except (A), tow-away prevention depends upon the operator observing and correctly identifying that it is safe to move a cylinder bundle or pallet. For this reason operator training and awareness of the importance of these systems and the hazards is critical (See also EIGA Safety Information HF 02/08: “Training and Competence”).

The specific solution implemented should be appropriate for the filling system and a documented risk assessment should be performed to identify the advantage and disadvantage of any changes in the context of the local site layout and organisation.

Some examples of these preventive measures (best practice) are shown on the next pages:

Automated mechanical interlock system (A)

The pallet or bundle is restrained by a belt that is locked at one end. In order to release the belt, the hose connector must be disconnected and "parked" in a position with a built in sensor. The key attached to the end of the hose can then be used to release the key that unlocks the belt.

Automated mechanical interlock system (A)

The pallet or bundle is filled behind an automatic barrier. In order to open the barrier, the hose connector must be disconnected and "parked" in a position with a built in sensor. Only then can the barrier be opened.

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Automated mechanical interlock system (A)

The pallet or bundle is filled behind an automated chain barrier. In order to open the barrier, the hose connector must be disconnected and "parked" in a position with a built in sensor. Only then can the barrier be opened.

Indicator device (B)

A warning light above the bundle is on while the bundle is connected to the filling system.
When the filling hose is not connected, the connector is attached to a parking position on the manifold and is recognized by a sensor which switches the warning light off (see small picture)
In this case it is still possible to remove the pallet or bundle with a fork lift truck!

Clearly visible fill connections (facility design - C)

This filling manifold positions the fill connections in front of the bundles so that the connections can be easily seen when the bundles are approached by a fork-lift operator.
However it is still possible to remove the pallet or bundle with a fork lift truck!

Additional warning signs are recommended!

Effective sign device and simple manual system that physically prevents removal of bundles or pallets (D)

A metal plate (could be magnetic) with a warning inscription covers the fork openings under the pallet or bundle while it is connected to the filling system so that fork access to the bundle is blocked.

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Effective sign device and simple manual system that physically prevents removal of containers (D)

Part of the sign framework slides under the pallet (bundle), so that fork arm access to the pallet is blocked while it is connected to the filling system!

Warning signs (E)

It is impossible for the fork lift driver to see the fill connections here. A traffic cone placed on the top of the bundle can be used as a clearly visible sign that the bundle is still connected to the filling system.

However it is still possible to remove the pallet or bundle with a fork lift truck.

A combination of magnetic warning signs (E) and warning indicator (B)

A sensor beam switches the filling system off and activates an audible alarm if the operator or a vehicle approaches the bundles and "breaks" the beam.
In this example the operator has to use a remote temperature sensor to check the cylinder temperature! Additionally, magnetic placards are attached to the bundle frame and present a clear sign that the pallets are still connected
A fork lift truck can still remove the pallet, but the signs and audible alarm signal reduce the probability of a tow away and the risk of gas loss is reduced.

The Safety Advisory Group request all member companies to highlight the particular issue described in this newsletter and ensure that managers/employees are aware of these risks.

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