PREVENTION OF TOW-AWAY INCIDENTS

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PREFACE

As part of a programme of harmonization of industry standards, the European Industrial Gases Association (EIGA), publication, *"Prevention of Tow-away Incidents",* has been used as the basis of an internationally harmonized gas association's publication on this subject.

This publication is intended as an international harmonized publication for the worldwide use and application by all members of Asia Industrial Gases Association (AIGA), Compressed Gas Association (CGA), EIGA, and Japan Industrial and Medical Gases Association (JIMGA). Regional editions have the same technical content as the EIGA edition, however, there are editorial changes primarily in formatting, units used and spelling. Also, any references to regional regulatory requirements are those that apply to European requirements.

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1. INTRODUCTION

Before moving a bulk delivery vehicle, the failure to disconnect the product delivery hose(s) that connects the vehicle to a storage tank or utilisation point can lead to a serious incident.

A tow-away incident occurs when flexible hose(s) used to transfer product between a delivery vehicle and stationary equipment is not disconnected prior to moving the vehicle. When this occurs, flexible hoses and the interconnecting piping can be damaged or fail.

Moving the vehicle while delivery hose(s) are still connected to fixed equipment creates the potential for equipment damage and a hazardous atmosphere. Personal injury can be caused due to:

- a large quantity of gas or liquid under pressure being released by the ruptured hose(s) and the production of a potentially hazardous atmosphere (oxygen enriched or deficient) that can lead to cold burns, asphyxiation, fire or explosion; and

- if the hose(s) resists the pulling effort and does not break, the vehicle can, in certain cases, pull away part or the whole of the fixed equipment or damage the delivery vehicle pipework.

Such incidents can lead to disruption of service**.**

2. SCOPE AND PURPOSE

The primary objective of this publication is to recommend practical methods for preventing road vehicles being moved away while still connected to fixed equipment. It supports compliance with the relevant requirements of existing regulations and standards.

This publication is also applicable to vehicles carrying cryogenic receptacles that are filled or emptied into a fixed installation while on board the vehicle.

Prevention of tow-away incidents of rail transportation is not discussed in this publication. However, the principles discussed may be appropriate in some cases.

This publication also covers breakaway couplings which minimize the consequences of tow-aways, should they occur. These devices may be considered for use for transfilling from both road vehicles and rail wagons.

3. DEFINITIONS

For the purpose of this publication, the following definitions apply.

3.1. Publication Terminology

3.1.1. Shall

Indicates that the procedure is mandatory. It is used wherever the criterion for conformance to specific recommendations allows no deviation.

3.1.2. Should

Indicates that a procedure is recommended.

3.1.3. May

Indicates that the procedure is optional.

3.1.4. Will

Used only to indicate the future, not a degree of requirement.

3.1.5. Can

Indicates a possibility or ability.

3.2. Battery vehicle

A vehicle containing elements which are linked to each other by a manifold and permanently fixed to a transport unit. The following elements are considered to be elements of a battery-vehicle: cylinders, tubes, bundles of cylinders (also known as frames), pressure drums as well as tanks destined for the carriage of gases with a capacity of more than 119 gallons (450 litres).

3.3. Multi-element Gas Container (MEGC)

Multimodal assembly of cylinder, tubes or bundles of cylinders that are interconnected by a manifold and which are assembled within a framework. The MEGC includes service equipment and structural equipment necessary for the transport of gases.

4. SYSTEMS TO PREVENT TOW-AWAYS

Each trailer and rigid (straight) truck with a permanently attached bulk liquid tank with a water capacity of 3785 litres (1000 gallons) or greater, and all tube trailers and/or battery vehicles shall be equipped with air brake locks or other controls that actuate when the hose is connected during loading and unloading.

Newly manufactured equipment shall be equipped with a tow-away incident prevention system.

Equipment not originally manufactured with an tow-away incident prevention system may be operated with administrative controls.

Any system to prevent tow-aways should include the following elements:

- putting in place procedures or work instructions; and
- training and competency testing of drivers and/or operators ; and
- providing technical solutions**.**

Each tow-away incident prevention system shall be subjected to a risk assessment before it is implemented and in some cases could require regulatory authority approval.

4.1. Procedures

The procedure for loading and unloading should include the description of actions and checks necessary to prevent tow-aways.

An abridged version of the procedure may be posted at the fixed installation or in the piping cabinet of the delivery- vehicle.

Procedures relying only on administrative controls such as the exchange of keys of road vehicles (the driver leaves his engine key to the person in charge of loading vehicles) have been less satisfactory because they do not exclude human errors. These procedures should be used only on an interim basis until the technical solution is applied.

4.2. Training

Training should ensure that the drivers and operators recognize the hazards and risks of the activity and that the content of the procedures are understood, correctly applied and drivers and operators have successfully completed competency testing.

The competencies in terms of knowledge and skills of the drivers/operators will be assessed before they are authorized to perform loading and unloading operations. The competencies shall be reassessed at regular intervals. The training and assessments shall be recorded in the individual records of the driver or operator.

Driver/operators shall be made aware of the tow-away incident prevention systems, including method of operation during training. Transport equipment hired for short terms shall be included.

Training shall be given to both company employed drivers/operators and those drivers/operators employed under contract terms.

Drivers/operators shall not use systems they have not been trained on.

4.3. Technical Solutions

The experience of the gas industry shows that technical solutions relying on devices to prevent movement are highly effective methods such as the automatic activation by interlocking of the braking system.

Any technical solution implemented shall be part of a maintenance program and their operation checked and verified periodically.

Other solutions relying on manual intervention can provide an acceptable level of safety based on a risk assessment, such as:

- the use of warning signs (a warning placard is installed in front and at the rear of the vehicle as long as the transfer hose is connected);
- the use of warning signals (a lamp is lit in the drivers cab as long as the transfer hose is connected); or
- the closing of a barrier in front of the transport unit.

5. DESCRIPTION OF THE TECHNICAL SOLUTIONS

5.1. Interlock with the Braking System

5.1.1. General

The activation of the braking system is intended to prevent tow-away incidents.

The braking system can be activated in different ways and the selection of the system will depend on:

- product transported;
- type of vehicle and
- applicable transport regulations.

Air brake interlock systems shall have no effect on the normal operations of the braking system.

Installation of air brake interlock systems on vehicles or modification of such systems shall not contravene the approval of vehicles with regard to braking. Interlock braking systems could need official approval in some countries.

Where the safety devices are fitted to trailers hauled by tractors which are not dedicated to the trailer, checks shall be carried out to ensure that the change of the tractor unit does not defeat the safety device.

5.1.2. Systems for tank-vehicles, trailers, semi-trailers and battery-vehicles

These systems comprise a device coupled into the brake circuit and is operated by the driver / operator when gaining access to the fill / discharge couplings / connections.

The device either:

- blocks opening of the pipework cabinet doors and/or
- blocks access to the couplings / connections and/or
- is activated when the cabinet doors are opened.

The device movement either applies the brakes or secures the brakes from being released.

When there is a system that operates on the brakes, it is recommended that the brakes be power applied and operate on all axles of the trailer.

On finishing a customer delivery or filling, the driver / operator has to disconnect the coupled hose(s) before the device can be deactivated. When the device is deactivated the brakes are released or the brakes can be released from within the cabin.

This system can be adapted to fit most positions of fill / discharge couplings / connections and types of cabinet door configurations. It can be adapted to work either on the pressure side or on the spring brake side of the brake circuit.

Appendix A shows an example of a typical diagram of a braking system fitted with an interlock system. Appendix B shows typical interlocking devices activated by doors or couplings / connections and .also shows visual and acoustic warning devices.

5.1.3. Systems for Tank-Containers and MEGCs

Since tank containers and MEGCs can be transported on different combinations of tractor units or chassis it is difficult to have any interlock system operating a tow away prevention system that activates the vehicle brakes. Therefore other methods shall be considered, such as a king pin lock which is locked when the ISO container is in service. The key is then removed and kept by the person in charge of the system.

5.2. Interlock with a Barrier

This system operates with a barrier in front of the vehicle being loaded or unloaded. The barrier is activated by a switch, mounted on the support of the filling hose. See layout on Appendix C.

As soon as the filling hose is removed from the support, the barrier closes automatically; if the hose is put back on the support the barrier opens. The switch should be of a type which cannot be easily abused, e.g. a switch which opens by the specific magnetic properties of the filling hose or a switch activated by a chip / receiver combination.

The system can be used at filling areas of vehicles. It is completely independent of the vehicle which is loaded.

To avoid tow-aways caused by reversing, a second barrier behind the vehicle may be installed. The visibility of the barrier when in closed condition should be ensured at all times.

5.3. System Consisting of Visible and/or Audible Alarms

This system, when installed, provides a visible and/or audible alarm to the operator if the cabinet doors are open when the vehicle is moving or trying to be moved.

6. SYSTEM TO MINIMIZE THE CONSEQUENCE OF TOW-AWAYS

6.1. Liquid Product

A breakaway coupling may be installed to minimise the consequences of tow-aways in addition to the measures described in section 4 or if vehicles without tow-away prevention systems are expected at the filling station, e.g., tank wagons.

Breakaway couplings are passive devices that are fitted at the fill point between the stationary pipe-work and flexible transfer hoses used for filling or discharging tankers with liquid product. Figure 1 shows a typical installation for tanker filling.

Figure 1Typical breakaway coupling for liquid filling

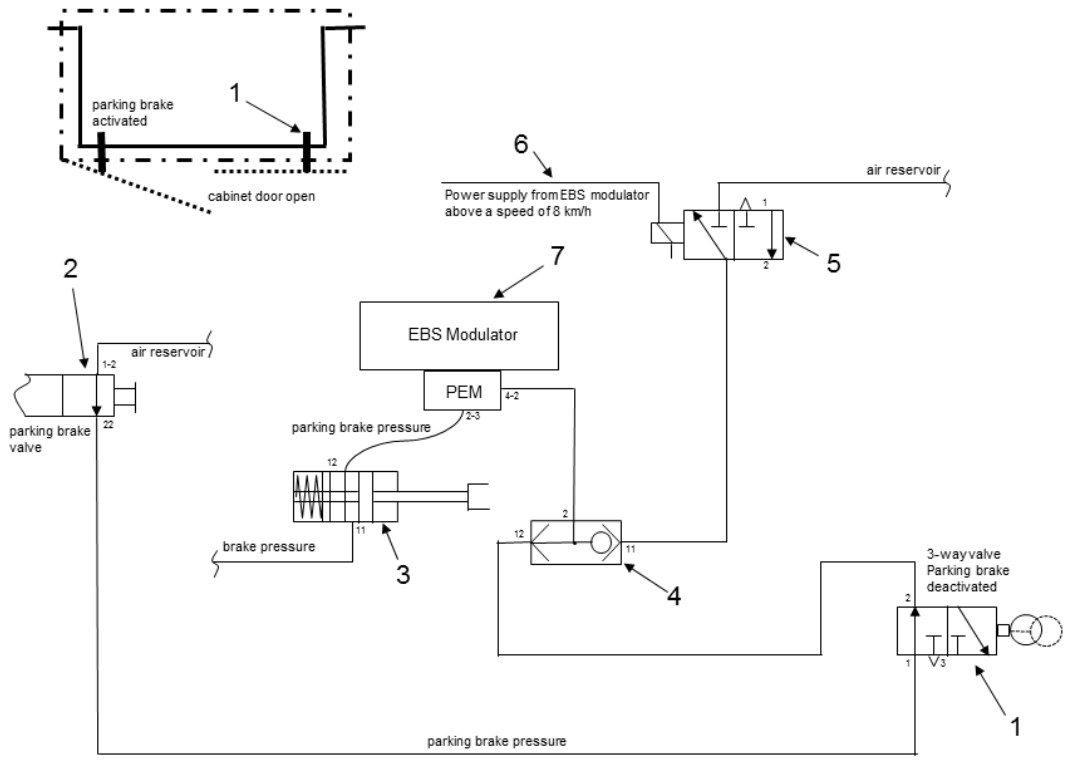
In case of a tow-away incident the breakaway coupling separates and seals, closing off the tanker and the source preventing any leakage. However the hose still remains attached to the vehicle.

6.2. Gaseous Product

A breakaway coupling may be used for gaseous products, which consists of a hose with two spring loaded valves at either end that are held open under normal operation by a wire, see figure 2. In the event of a tow away the wire parts and the valves close.

Figure 2 Typical breakaway coupling for gaseous filling

Appendix A: Example of an interlocking device



	Quantity	Name	Layout
1	2	3-way valve	With guide roller
2	1	Parking brake valve	PREV
3	4	Spring brake cylinder	
4	1	2-way valve	
5	1	3-way magnetic valve	
6	1	Magnetic valve cable	24 volt
7	1	2-way valve	With spring retention

Figure A-1: Typical diagram of interlock with braking system (deactivation above 8 km/h)

Appendix B: Typical tow-away incident prevention devices

Figure B-1: Tow-away incident prevention device blocking the coupling when activated

Figure B-2: Interlock with braking system active when cabinet door is opened

Figures B-3 Visual and acoustic warning signs

Appendix C: Layout of interlock with a barrier