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Item 2 of the provisional agenda
Tanks

Holding times for the carriage of refrigerated liquefied gases

Transmitted by the European Industrial Gases Association

Introduction

This document is in response to item 1 and the questions posed by the tanks working group of Annex 1 of the Report of the Joint Meeting of the RID Committee of Experts and the Working Party on the Transport of Dangerous Goods, [ECE/TRANS/WP.15/AC.1/126/Add.1] during the spring 2012 session held in Bern from 19 to 23 March 2012.

Item 1: ECE/TRANS/WP.15/AC.1/2012/1 (UIC) and informal document INF.32 (EIGA)

Premature activation of safety valves in the carriage of refrigerated liquefied gases in RID/ADR tanks; taking over the provisions for portable tanks with respect to holding times and reference holding times for RID/ADR tanks. The questions below are in response to the report of the meeting.

Which methods exist currently and are deemed appropriate for the calculation of the actual and reference holding time?

There are international standards EN 12213 and ISO 21014, both are adequate for the construction of new tanks, where the insulation values are known and can be calibrated against an actual holding time test. EIGA document 041/10, which is more appropriate to tanks in service and there are also graphical methods available. The difficulty is to be able to gauge accurately the deterioration of the insulation system in service over time, and the environmental conditions to make any calculations meaningful.

How should deterioration of insulation be taken into account over the normal lifecycle of a tank?

Having consulted with manufacturers and users there is no calculation method that they have confidence in to use when the equipment is in service. This is why some of them revert to the ‘rule of thumb’ that the insulation systems deteriorates such that the holding time decreases by one day per year of service.

Users have anecdotal evidence as to how these insulation systems perform in service.

For tanks with vacuum insulation or tanks with vacuum insulation and an additional nitrogen shield, manufacturers and users recognize that the insulation system is either present and satisfactory or the vacuum has been lost. The performance of the insulation system does not tend to drop off over time it is either functioning or not. Due to the nature of the products carried in these tanks, refrigerated liquefied gases, any loss of vacuum is quickly apparent as the safety valves would relieve continuously as without a vacuum the product boils rapidly. Therefore it could be assumed that the reference holding time is similar to the actual holding time. The efficiency of the insulation system could be checked by taking a vacuum reading if required, but this is one way to loose a vacuum. Tanks of this type typically have holding times of greater than 20 days.

For tanks with foam insulation, the efficiency of the foam insulation can, and will deteriorate with time, and it is common practice to remove the insulation and re insulate the tanks after they have been in service for an amount of time. There is no accurate in service method to ascertain the efficiency of the insulation system apart from actual in service experience, or carrying out a physical test, to ascertain the effectiveness of the insulation system. Tanks of this type typically have holding times of less than 20 days.

Should there be an evaluation of the insulation effectiveness with each periodic inspection?

Users were in agreement with the sentiments of the Working Group as it was felt that this would lead to very expensive testing protocols both for the notified bodies and for industry compared to the added value. Also any deterioration between periodic inspections would still have to be taken into account.

Should the scope be limited to RID tank-wagons or also include tank-containers and tank-vehicles?

The Working Group agreed in Berne that not only RID tank-wagons were concerned but tank-containers should also be treated in the same way. As they typically have much shorter trips and are attended by a driver it was not deemed necessary to extend the scope also to tank-vehicles also for the moment.

The requirement to calculate the actual holding time is detailed in the sub section 4.2.3 *General provisions for the use of portable tanks for the carriage of refrigerated liquefied gases*, with the specific requirement in 4.2.3.7 *Actual holding time*, these tanks are vacuum insulated.

Whereas 4.2.2 *General provisions for the use of portable tanks for the carriage of non-refrigerated liquefied gases* does not have a requirement to calculate or mark the actual holding time, these tanks are used to transport non-refrigerated liquefied gases and are foam insulated.

The requirement in these two sections does not appear to be consistent.

Summary

There are two basic insulation systems used for refrigerated and non-refrigerated liquefied gases.

There is no accurate method to determine the deterioration of the in service insulation system, either vacuum or foam that would provide an accurate measure of the insulation system.

To be able to complete a meaningful actual holding time calculation then a number of variables need to be considered, apart from the actual properties of the fluid (which can be obtained), and the efficiency of the insulation system:

Environmental:

- the outside air temperature, amount of sunlight, where the vehicle is parked, in the sun or shade.

Mechanical:

- condition of the paintwork, which can affect the efficiency of the insulation system.

Procedural:

- delays prior to transport e.g. being held in a siding, for a number of days before shipping, without the pressure being lowered.

- delays during transport, i.e. held at a border or delayed during transport for rail operational reasons.

Who would be expected to carry out any calculation?

Another issue is when the vehicle is ‘empty’ being returned by the customer, even though the vehicle may be ‘empty uncleaned’ it still may have some liquid in it, and if it is not vented to the correct pressure then the safety valves can operate. In the case of being returned from a customer who would be responsible for ascertaining the actual holding time and doing any calculation if required?

The two most important points in preventing premature operation of the safety valves are:

- Ensure that the tank is cooled down correctly so when it is filled with liquid it did not generate flash gas raising the pressure.

- The tank pressure is reduced prior to transport, i.e. the vessel is blown down before travelling.

Therefore considering the above points EIGA is requesting the help of the experts from the tanks working group in deciding the way forward.