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Geneva, 13–23 September 2011
Item 2 of the provisional agenda
Tanks

Additional measures after emptying tanks of liquefied gas at very low temperatures

Transmitted by the Government of France^{1,2}

Summary

- Executive summary:** Additional measures to be taken after emptying a tank transporting liquefied gas in order to protect against drops in pressure.
- Decision to be taken:** Add a new paragraph to 4.3.3.3 of RID/ADR.
- Related documents:** Informal document INF.31 presented at the Joint Meeting in March 2011
ECE/TRANS/WP.15/AC.1/122/Add.1, item 11

¹ In accordance with the programme of work of the Inland Transport Committee for 2010–2014 (ECE/TRANS/208, para. 106, ECE/TRANS/2010/8, programme activity 02.7 (c)).

² Circulated by the Intergovernmental Organisation for International Carriage by Rail (OTIF) under the symbol OTIF/RID/RC/2011/51.

Introduction

1. At the Joint Meeting in March 2011, France submitted an informal document (INF.31) giving some information on a tank-wagon's violent collapse at a low temperature (-18° C) on 27 December 2010. The tank contained residues of butadiene, UN No. 1010 (see annex).
2. The Working Group noted that at the time of the tank's construction (1968), no requirements were in place to protect tanks against the risk of deformation due to negative internal pressure, although such requirements have been set out in 6.8.2.1.7 since 2003 (where the vacuum pressure is set at 0.4 bar). It was calculated that the tank, not being equipped with stiffening rings, was not able to withstand vacuum pressures of more than 0.2 bar.
3. The Working Group proposed including provisions in Chapter 4.3 for existing tanks to be filled with nitrogen after unloading to protect the tank against vacuum pressure.
4. The French Government proposes that a new paragraph be added to subsection 4.3.3.3 (Operation).

Proposal

5. Add the following new paragraph 4.3.3.3.4 to subsection 4.3.3.3:
"4.3.3.3.4 In periods when very low temperatures may occur, measures shall be taken during or after unloading to protect tanks transporting liquefied gas against the risk of deformation due to negative internal pressure, by filling them with nitrogen or another inert gas in order to maintain sufficient pressure inside the tank."

Justification

6. A similar incident had already occurred in 1976 when 21 tank-wagons used for the transport of liquid hydrocarbons were damaged in one night as a result of a drop in pressure. At the time, recommendations similar to those proposed here were made by professional organizations but have not always been followed.
7. The addition of this clause to RID/ADR aims to avoid a repetition of such incidents, which could have very serious consequences.

Annex

Description of the event

1. An empty unloaded, uncleaned tank-wagon containing residues of butadiene (UN No. 1010) spent some time under low temperature conditions (from the date of unloading, 20 December, to 27 December). The temperature reached a minimum of -18°C on 27 December.
2. The tank then collapsed due to internal pressure changes probably caused by the liquefaction of butadiene.



3. The remaining mass of the product in the tank was estimated to be 870 kg.
4. The accident caused no major damage (except to the tank itself) because it happened while the wagon was stopped inside a marshalling yard. The consequences could have been much more serious if the tank-wagon had been in service, given that the dimensions of the deformed tank exceeded the rail loading gauge.

Tank characteristics

Date of construction: 1968

Tank code: P14BH

Capacity: 116,000 l

Comments

5. The vapour pressure curve of butadiene shows that this type of tank was not designed to withstand the vacuum pressure created at -20°C (which explains the deformation).

