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OTIF/RID/CE/GTP/2017/14

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Original: German

RID: **8th Session of the RID Committee of Experts' standing working group**
(Utrecht, 20 to 24 November 2017)

Subject: **Continued use of tank-wagons for the carriage of gases of Class 2 in accordance with the transitional provisions in RID 1.6.3.3.2 to 1.6.3.3.5.**

Proposal transmitted by Austria

Introduction

1. The transitional provisions for the continued use of tank-wagons for the carriage of gases of Class 2 amended on 1.1.2015 allow:

- Tank-wagons built between 1 January 1965 and 31 December 1966 to be used until 31 December 2019 (**1.6.3.3.2**),
- Tank-wagons built between 1 January 1967 and 31 December 1970 to be used until 31 December 2021 (**1.6.3.3.3**),
- Tank-wagons built between 1 January 1971 and 31 December 1975 to be used until 31 December 2025 (**1.6.3.3.4**),
- Tank-wagons built between 1 January 1976 and 30 September 1978 to be used until 31 December 2029 (**1.6.3.3.5**).

2. Germany's proposal to the 13th session of the working group on tank and vehicle technology (OTIF/RID/CE/GT2012/3) and the discussion document (INF.10) for the 1st session of the RID Committee of Experts' standing working group explained in detail the differences in minimum wall thicknesses, the quality of the materials and their use and contained a comparison of the safety levels. The basic condition underlying the transitional provisions is that the tank-wagons must satisfy the provisions of Chapter 6.8 in terms of their equipment.

Current situation

3. Since the transitional provisions entered into force, numerous checks focussing on specific points have been carried out on such tank-wagons in Austria. In 2015 and 2016, defects were found on more than 10% of the gas tank-wagons checked.

4. In general, it was observed that although the equipment on the “old” tank-wagons met the requirements of Chapter 6.8 in theory, for the most part they were inoperable.

5. Main defects observed:

- Use of very outdated bottom valves (especially of a mechanical design) which are no longer used in newer tank-wagons,
- Sluggish performance of service equipment,
- Operating instructions do not correspond to the actual equipment,
- Open bottom valves,
- Valves not closed completely as a result of technical defects,
- Valves open as a result of emergency forcing screws being screwed in,
- Open bottom valves and pieces of equipment fixed with stones or wooden wedges and wire,
- Broken bottom valve rods,
- Valves indicated incorrectly or opening levers incorrectly mounted,
- Pieces of equipment missing,
- Position of valves not displayed or display not working.

6. In the event of a derailment, the defects discovered would facilitate the leakage of the load and could then result in consequences as in Viareggio or Hitrino.

7. It is clear that at the same time, these defects constitute infringements of the regulations, which, if the safety obligations of participants (particularly fillers, operators and ECMs) in RID Chapter 1.4 were complied with, should not occur. However, practice reveals that they occur relatively frequently. The age of the valves is doubly problematic. In addition to technical defects, which occur more frequently, the staff of the participants concerned have increasingly less knowledge about how these valves work. The situation in terms of both these aspects can be expected to get worse in the years to come. The authorities and infrastructure managers cannot carry out 100% checks to guarantee that the provisions are complied with completely.

Motive and conclusion

8. A risk assessment carried out by ÖBB-Infrastruktur (see Annex – in German and English only) shows that from the point of view of risk, tank-wagons built after 1978 appear to be 60 times safer; in other words, the likelihood of serious incidents occurring is 60 times lower. The checks carried out on an ongoing basis also show that the tanks deviate from the current state of safety technology, thus constituting a greater potential risk.

9. This would support the immediate withdrawal from service of these wagons. However, Austria is aware that the existing transitional provisions have created the basis for confidence in their continued use, which is counter to the negative experience that has been gained in the meantime and to the still to be expected deterioration.

Proposal

10. Austria therefore proposes to set the end date for the transitional provisions in 1.6.3.3.4 and 1.6.3.3.5 at the same date as in 1.6.3.3.3, i.e. 2021.

Risk Assessment Report

Assessment of risk mitigation by means of the timely withdrawal of RID gas tank-wagons that do not meet the provisions of 1978

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Order number: RA 018-17

Background

For the carriage of highly sensitive goods (chlorine, carbon disulphide, hydrocarbon gases), tank-wagons are used whose characteristics (prerequisite for carriage) are governed by RID. On the basis of transitional periods, “old” tank-wagons are also used, whose technical standard no longer corresponds to current requirements.
However, gas tank-wagons that do not meet the provisions in force since 1 October 1978 may still be used on the basis of the transitional provisions in RID, sometimes up to 2029.
Note:
In Austria, carbon disulphide is now carried exclusively in new (mostly Wascosa) tank-wagons with the appropriate equipment, and is not therefore considered further in this analysis.

In the version of RID in force at the time of this RAR, there are transitional provisions for the continued use of older gas tank-wagons that were last amended on 1.1.2015. Based on the growing number of incidents, the transitional periods in the paragraphs in red would appear to be too long. In these cases, the period should be shortened.

1.6.3.3
Tank-wagons whose shells were built before the entry into force of the requirements applicable as from 1 October 1978 may still be used if their wall thickness and items of equipment meet the requirements of Chapter 6.8. = Indefinitely

1.6.3.3.1
Tank-wagons which are intended for the carriage of gases of Class 2 and whose shells were built before the entry into force of the requirements applicable from 1 January 1965 may still be used until 31 December 2017 if their items of equipment but not their wall thickness meet the requirements of Chapter 6.8.

1.6.3.3.2
Tank-wagons which are intended for the carriage of gases of Class 2 and whose shells were built between 1 January 1965 and 31 December 1966 may still be used until 31 December 2019 if their items of equipment but not their wall thickness meet the requirements of Chapter 6.8.

1.6.3.3.3
Tank-wagons which are intended for the carriage of gases of Class 2 and whose shells were built between 1 January 1967 and 31 December 1970 may still be used until **31 December 2021** if their items of equipment but not their wall thickness meet the requirements of Chapter 6.8.

1.6.3.3.4
Tank-wagons which are intended for the carriage of gases of Class 2 and whose shells were built between 1 January 1971 and 31 December 1975 may still be used until **31 December 2025** if their items of equipment but not their wall thickness meet the requirements of Chapter 6.8.

1.6.3.3.5
Tank-wagons which are intended for the carriage of gases of Class 2 and whose shells were built between 1 January 1976 and 30 September 1978 may still be used until **31 December 2029** if their items of equipment but not their wall thickness meet the requirements of Chapter 6.8.

Subject:

Aim:
Gas tank-wagons built after the rules in force since 1.10.1978 are characterised by the greater wall strength of the metal sheets and a different type/quality of steel. In addition, the construction of the bottom valve has generally been improved. These measures reduce the risk of the load leaking in the event of a serious incident as a result of the significantly improved ductility. The material strength and type/quality of the steel appreciably help avoid the risk of the tank wall rupturing and the penetration of objects.
The aim of this risk analysis is to show the risk reduction mathematically.

Intention:
Tank-wagons not built at least in accordance with the provisions of RID applicable from 1.10.1978 should be replaced in the next 1-2 years and no longer used.
An immediate measure that is planned is to prohibit these wagons from being operated.

Regulations:

Currently applicable version of RID.

Assumptions:

The calculation is made in the form of a semi-quantitative approach. The experts involved make certain assumptions.

The basis for the calculation is the average number of all incidents

- Train – collision
- Train – derailment

in the last 11 years.

Calculation:

- On average each year, 1/5 of trains are freight trains.
- 11% of freight trains on the network have at least one RID wagon in the train.
- The number of relevant incidents is an average of those in years 2006 to 2016 taken from the statistics (unit BL – Safety) on derailments and collisions.
  Derailment and collisions were considered relevant because in such events, the load may leak as a result of the technical devices failing.
- The values assumed in the columns are estimates made by the experts based on:
  - the condition of the bottom valves after incidents and in checks
  - awareness (because of their activities) of incidents and the causes thereof.

Number of freight trains per hour with an RID wagon =
(((total number of trains)/5)/100)*11)/(24h*365 *hours of operation*)

Calculation according to “hours of operation” in order to reach values that are comparable to our safety targets.

Factor =
Number of incidents (average)/number of freight trains per hour with an RID wagon

Differences between pre- and post-1978 wagons:

– Tougher steel (ductility) and hence greater resistance to penetration by objects.

– Wall thickness (strength). It is not possible to make a general statement about the degree of strength as it depends on the medium to be carried (standardised calculation rules).

– More reliable bottom valves with clear operating and maintenance instructions.

Consideration of the risk potential

This risk analysis was split into 2 “risk potentials”, as follows: Risk potential 1 shows the findings from inspections obtained as a result of the technical differences between the wagons. Risk potential 2 is a semi-quantitative calculation. It is semi-quantitative because the likelihoods were estimated by the experts. The statistics do not differentiate between wagons before and after 1978, so it was not possible here to calculate or ascertain any values.

Risk potential 1 Leakage of dangerous goods with no preceding incident (derailment/collision)

Reason:

.) The bottom valve design type in question may remain in the open position as a result of incorrect operation of the emergency forcing screw.

.) This results in the load coming into contact with the side valves and blank flange covers. In this case, the unprotected pipes contain dangerous goods which continue to flow until the tank is emptied.

.) Maintenance: Owing to the age of these wagons, there are maintenance difficulties with regard to:

– replacement parts (sometimes no longer available)
– knowledge of the technical characteristics of these wagons

.) As it is planned to withdraw these wagons by 2029 at the latest (see Background), it can be assumed that they are no longer state of the art.

Inspection data:
In 2015 and 2016 (as at May 2017) (source RCA)

- **640** gas tank-wagons were inspected, of which
- **76** wagons had at least one of the defects listed above.

For the reasons listed above, it can therefore be deduced that there is potentially a high risk of dangerous goods leaking.

Risk potential 2 Leakage of dangerous goods after an incident (derailment/collision):

This risk potential is calculated with an event tree. The values entered and used here were defined in coordination with the experts at the meeting.

The basis of calculation is the factor calculated in accordance with the formulae described in the paragraph on “assumptions”.

The calculation is shown on the following page as an event tree.

Semi-quantitative Hazard Assessment:

	Wagon event concerned (derailment/collision)		Piping behind bottom valves is wrenched off		Bottom valve leaks/is open		Tank wall penetrated				Result
							YES before 1978	0.02			4.51E-11
							YES after 1978	0.01			7.52E-13
					YES before 1978	0.3					
					YES after 1978	0.01					
							NO before 1978	0.98			5.16E-09
							NO after 1978	0.99			7.45E-11
							YES before 1978	0.02			1.05E-10
							YES after 1978	0.01			7.45E-11
					NO before 1978	0.7					
					NO after 1978	0.99					
			YES	0.9			NO before 1978	0.98			No leakage
Factor							NO after 1978	0.99			No leakage
4.17806E-08	YES	0.2									
							YES before 1978	0.02			1.17E-11
			NO	0.1			YES after 1978	0.01			8.27E-12
					NO before 1978	0.7					
					NO after 1978	0.99					
							NO before 1978	0.98			No leakage
							NO after 1978	0.99			No leakage
	No	0.8	Not considered further, as the experts estimate the likelihood of leakage without derailment/collision beforehand to be less than the calculated likelihood.								
	The possibility of the piping NOT being wrenched off and the bottom valve not being open/leaking was also not calculated, as this would not lead to any leakage.										

		Derailment		Collision	
	2006-2016	2006	16	2006	4
Average no. derailments	12.27272727	2007	17	2007	5
Average no. collisions	4.636363636	2008	15	2008	4
		2009	12	2009	8
Total trains/year	2100000	2010	14	2010	6
		2011	8	2011	5
Factor	4.17806E-08	2012	14	2012	3
Potential for derailment/collision per freight train with RID tank-wagons per hour of operation		2013	13	2013	6
		2014	5	2014	2
		2015	9	2015	5
		2016	12	2016	3
			12.2727273		4.63636364

Safety requirements/result:

In order to reinforce the validity of this document, 2 risk potentials were considered.

Risk potential 1: Here, the statistical values of the checks on relevant gas tank-wagons carried out by ÖBB Infrastruktur are reflected. If the piping necessary for unloading that is situated behind the bottom valve were wrenched off, it is very likely that wagons built before 1978 would leak. This could occur as a result of a collision with objects or if a vehicle travels over a railway crossing without authorisation.

Risk potential 2: Here, the likelihood is calculated of dangerous goods leaking from wagons built before 1978 in comparison to wagons built after 1978 following a collision/derailment. The result shows that for wagons built before 1978, in the worst case scenario (bottom valves leaking/open and tank wall penetrated), the likelihood is greater by 2 powers of ten.

Likelihood for wagons before 1978 : **4.51E-11**
Likelihood for wagons after 1978 : **7.52E-13**
Consequently, the likelihood of dangerous goods leaking from gas tank-wagons that do not meet the provisions applicable after 1978 is 60 (451/7.52) times greater than for wagons of a newer design type.

In summary, the experts, supported by the results of this RAR, recommend that the deadline for withdrawing wagons built before 1978, which is 13 years from the date of this RAR, should be reduced to the end of 2018. Another reason for this recommendation is the enormous extent of the damage that would occur if these chemicals were to leak.

It is also recommended that OTIF's report of the 13th session of the working group on tank and vehicle technology held in Rome on 11 and 12 April 2012 be taken into account.

Limiting factors:

None

Akzeptanz:

Das angewandte Verfahren und Methodik wird von allen der Sicherheitsanforderungen betroffenen Parteien akzeptiert.

Erklärung:

Der Risikomanager der ÖBB Infrastruktur AGist für die Richtigkeit der Methodik, der dazugehörenden Prozesse, des Ablaufs der Analyse und gemäß seiner Fachkenntnisse und Erfahrung mitverantwortlich für die Qualität der Inhalte.

Die Inhalte und die Ergebnisse basieren auf den Sachkenntnissen der beteiligten ÖBB Mitarbeiter. Alle Entscheidungen und Annahmen werden übereinstimmend getroffen, Ausnahmen werden gesondert angeführt. Diese Entscheidungen und Annahmen basieren auf den, zu diesem Zeitpunkt, gültigen und verfügbaren Informationen.

Der Vorschlagende bestätigt, dass alle ermittelten Gefährdungen und die damit verbundenen Risiken auf einem vertretbaren Niveau gehalten werden.

……..	…….
Risikomanager	Anfordernde der Risikoanalyse
(Robert Weber)	(Peter Kleinschuster)

Annex - Data collection

Collection of data RAR risk liquefied gas wagons from RCA Annual Report 2015/2016

2015:

289,585 dangerous goods wagon movements, of which 23,628 gas tank-wagons for Class 2 = **7.9%**

4431 dangerous goods inspections carried out/7.9% of which is ~ 350 liquefied gas tank-wagons

As liquefied gas tank-wagons in Austria tend to be carried in groups of wagons, rather than as individual wagons, and as the loading points are few and far between, it is more difficult for RCA GGBA to check them. The calculated percentage of 350 RID gas wagon checks is therefore reduced by 20% → ~ **280 liquefied gas tank-wagons inspections/2015**

2016:

301,391 dangerous goods wagon movements, of which 24,871 gas tank-wagons for Class 2 = **8.2%**

4412 dangerous goods inspections carried out/8.2% of which is **~ 360 liquefied gas tank-wagon inspections 2016**

Owing to the increasing number of defects on liquefied gas wagons, in 2016 RCA BL ordered that special checks be carried out. These were carried out on a particular proportion of train-load consignments. Therefore, for 2016 there is no need to reduce the number of Class 2 tank-wagons by 20%.

Summary of technical defects on liquefied gas wagons in 2015 and 2016

2015:

The 2015 summary documents 40 cases. The summary contains around 80% of all the technical defects on liquefied gas wagons in RCA trains in 2015.

Of these 40, 23 meet the criteria of the RAR→ aggregated over 100% this results in **28 tank-wagons** in 2015 that have been included in the analysis.

280 checks/28 relevant criticised points→ 10%

2016:

The 2016 summary documents 79 cases. The summary contains around 85% of all the technical defects on liquefied gas wagons in RCA trains in 2016.

Of these 79, 41 meet the criteria of the RAR→ aggregated over 100% this results in **48 tank-wagons** in 2015 that have been included in the analysis.

360 checks/48 relevant criticised points→ 13.3%
(In fact this percentage should be higher, because in the special checks in 2016, particularly problematic train-load consignments were checked. However, it should be noted that both keepers and wagon lessors reacted quickly and no longer used certain tank-wagons or used routes that did not go through Austria.