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Working Party on the Transport of Dangerous Goods

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Item 7 of the provisional agenda

Reports of informal working groups

Complementary information on the BLEVE prevention work and tests carried out

Submitted by the AEGPL, the European LPG Association

Background

In 2006, a proposal was submitted to the RID/ADR/ADN Joint Meeting by the ministry of Netherlands, for inclusion in the RID/ADR regulations of the requirement of thermal coating for Road and Rail tankers carrying dangerous goods that can BLEVE. An ad hoc RID/ADR BLEVE prevention working group was created with the following mandate:

- (a) Prevention of a BLEVE
- (b) Reduction of the effect of a BLEVE
- (c) Hot BLEVE and cold BLEVE should be considered
- (d) Technical and other measures should be taken into account
- (e) Other matters of principle.

The scope of the work was defined to cover all dangerous goods / substances that could cause a BLEVE in the Rail and Road modes of transport.

At that time, no conclusion was able to be drawn on how to proceed on ranking of the various possible proposed measures, due to lack of statistical information. It had been agreed however that the ranking of measures should also integrate a cost-benefit analysis.

The working group recommended to improve the statistical information available, by improving the reporting of accidents, the development of a statistical accident database at international level, and make this systematic. This work has begun and progress is being made largely under the leadership and initiatives of the French ministry, and with the encouragement and support of the European LPG Industry (AEGPL)

Following the work of this group a research project financed by Germany and France was given to BAM in order to produce a testing program which should include the following:

- (1) Definition of the conditions of a representative pool fire
- (2) Description of the criteria for the selection of the coatings to be tested
- (3) Description of the criteria for the selection of the safety valves to be selected, including evaluation of negative effects of safety valves (e.g. heat radiation)
- (4) Evaluation of the tests already performed by BAM, TNO and of tests described in literature, which results in a list of questions not answered
- (5) List of tests to be performed based on the not answered questions, including test priority.

A series of tests were carried out at BAM premises in Germany, the outcome of which was presented in the April 2013 Berlin meeting. The minutes of the meeting are part of the agenda of the Sept. 2013 session of the JM with the documents “ECE/TRANS/WP.15/AC.1/2013/61- (Netherlands) Report of the informal working group on the reduction of the risk of a BLEVE” and “INF.7 (Netherlands) Report of the informal working group on the reduction of the risk of a BLEVE – Annexes”

We believe that such a substantive piece of work does deserve a full review by the industry and we would urge the working group to allow this to happen before any specific proposals are made based on this testing programme. We hope that the full report will be communicated soon to all the working group members for a thorough review, necessary for such important decision making.

This AEGPL INF document is in support of the work carried out so far and should be considered together with the above submissions. It aims at summarizing this very important issue from the perspective of the European LPG industry. It is designed to complement available information and to draw the attention of the delegates to some specific and critical points, key for any decision making on the subject.

The AEGPL position

The AEGPL (European LPG Association) believes that the result of the study conducted so far does not contain sufficient justification to decide, at this stage, upon the application of a thermal coating to LPG road and rail tankers.

In addition the possible adverse effects of this not yet proven technology and its reliability require further study.

Proposals Summary

- (a) **BLEVE thermal coating mitigation effects:** The European LPG Industry wants to ask the RID/ADR Joint Meeting participants for their highest attention when discussing the thermal coating mitigation effects. A rush to impose any single perceived improvement measure could have a number of unintended consequences if not fully and properly evaluated.
- (b) **Road Traffic implications:** There is no doubt that the adoption of thermal coating will increase the LPG road tanker movements by between 5% to 7%. This would have a negative impact both on greenhouse gases and other pollutants emissions and it will also increase road traffic congestion and road traffic accidents from additional vehicle movements. The working group should be 100% convinced of the added benefits of any measure that would increase the number of TDG vehicles on our roads.
- (c) **RID/ADR BLEVE ad hoc Working Group mandate:** Before any decisions are taken, the working group must ensure that it has addressed fully all the points of the mandate that was given from the Joint Meeting to the ad hoc RID/ADR BLEVE prevention working group. Not only one mitigation measure should be studied but also and surely all preventive and containment measures
- (d) **BAM study/research project:** Before any decisions are taken, the RID/ADR BLEVE prevention working group should ensure that the scope of this project given to Germany and BAM has been fully covered and the outcome has been fully communicated to the members of the working group.
- (e) **Outstanding Questions:** Before any decisions are taken, all the remaining questions from the work carried out by the RID/ADR BLEVE prevention working

group and by BAM must be answered satisfactorily before any further proposals are tabled.

For all of these reasons the European LPG Industry urges extreme caution by the RID/ADR and associated groups when discussing the thermal coating mitigation measure. The European LPG Industry has a long history of good cooperation with RID/ADR and together we can be proud of the current safety performance of the LPG industry in Europe. We would like to see this work continue and look forward to further discussions relating to BLEVE prevention which is too important an issue to be dealt with by the imposition of one technological measure which has many question marks hanging over it.

Justification

The European LPG Industry Safety Heritage

The European LPG industry has been delivering LPG throughout Europe for over 75 years and from its inception, the industry has always put safety as its number one priority. Today, its safety record is world leading resulting from continuous improvement through smart regulation, technology and education. The main focus of the LPG Industry's safety management system has been on the prevention of the accidents, as opposed to mitigation, that only reduces the severity of the consequences, after the accidents have taken place (the role of the thermal coating). By working with national and international bodies, effective and practical standards, procedures, and training programs have been developed, covering all aspects of our business. There is no greater evidence of the effectiveness of this approach than the industry's record in Europe of BLEVE prevention and reduction.

BLEVE thermal coating mitigation effects

Whenever an LPG tanker is exposed to fire, the emergency services (fire brigades) use water to cool the tank and mitigate the risk of a BLEVE (mitigation refers to actions taken to control and minimize the hazardous consequences of an incident and is not related to incident prevention). This standard method, which all emergency services are trained and equipped on, relies on the capability for the steel container to be cooled rapidly, most often accompanied by simultaneous measurement of the temperature of the tank by thermal imaging, to provide essential safety information and protect the firefighters. Although no records exist for how many BLEVEs this simple and effective method has prevented, it has undoubtedly saved many lives over the history of the industry.

A tanker fitted with thermal coating, does not allow temperature measurement by thermal imaging and in addition, it also hinders significantly the usual visual checks of the condition of the tank surface during the emergency operations. This introduces additional risks for the emergency services, besides slowing down also the process of the cooling operations. We also believe that further risks exist from parts of the thermal coating becoming detached during an incident, leading to hidden hotspots and potentially endangering further the firefighting staff.

Thermal coatings would also hinder the currently applied rigorous testing and inspection regimes which rely on visual checks of the external tank condition.

Tank corrosion could also occur beneath the coating undetected, thereby increasing the risk of failure.

Our fundamental concern is that the discussion surrounding the application of thermal coating to LPG road tankers seeks to mitigate just one very rare consequence of one type of event (BLEVE). The measure proposed will make no contribution to reducing the risks associated with the circumstances leading to such an event happening.

The European LPG Industry urges extreme caution by the RID/ADR Regulators and associated groups when discussing the thermal coating mitigation effects. A rush to

impose any single perceived improvement measure could have a number of unintended consequences if not fully and properly evaluated.

Road Traffic Implications

A severe impact caused by a road accident could cause the failure of the tank shell (including also cases of what is known as cold BLEVE) or its equipment, resulting to total or partial loss of containment, without fire on the tank being a catalyst. Recent accidents have demonstrated the risk from this type of event higher than those from a hot BLEVE. A thermal coating would not reduce the effects of such events.

The additional weight of the thermal coating will cause an increase of tanker movements throughout Europe. The industry estimates this to be in the order of 5% to 7% with an equivalent increase in risk from all types of road transport incidents. The industry has a good safety record in the transportation of LPG by road and has invested millions of euros in ever improving technology which includes methods to reduce the number of tanker movements. This thermal coating proposal would be a completely retrograde step in our ambition to minimise the LPG industry's footprint on Europe's roads.

There is no doubt that the adoption of thermal coating will increase the LPG road tanker movements by between 5% to 7%. This would have a negative impact both on greenhouse gases and other pollutants emissions and it will also increase the road traffic accidents from additional vehicle movements. The working group should be 100% convinced of the added benefits of any measure that would increase the number of TDG vehicles on our roads.

RID/ADR BLEVE ad Hoc Working Group mandate

(in italics: text from formal RID/ADR Joint Meeting and related working group reports/documents)

The core mandate to consider measures to prevent the incidents of BLEVE together with reducing their effects does not appear to have been comprehensively addressed yet by the ad hoc RID/ADR BLEVE working group. Below is a summary of our understanding of the progress compared to the mandate, on the areas not fully covered yet.

1. *Hot BLEVE and cold BLEVE should be considered*

Only hot BLEVE has been considered so far (54% of the BLEVEs are cold BLEVEs – source TNO/Menso Molag 2008)

2. *Technical and other measures should be taken into account*

Not only hard technical measures are in the scope and we cannot see a thorough consideration of the “other measures” in the studies and reports that have been produced so far.

3. *In past Joint Meeting reports, was stated that no conclusion was able to be drawn on how to proceed on ranking of the above measures, by lack of statistical information at that time.*

We have not seen yet the answer to this. We are aware however that the statistical information missing at that time will be easier available in the future through the accident database at international level that is now progressing (the first meeting of the related working group will be in Oct.2013). It is important that the information from this database is well analysed for focusing the efforts to the critical and root cause issues that will make the highest improvement impact.

4. *It had been agreed that the ranking of measures should also integrate a cost-benefit analysis.*

We have not seen any work yet on this, a decision should be made on how to proceed on ranking of the various preventive measures, integrating also cost benefit analysis

5. During its work, *the working group recommended to improve the statistical information available, by improving the reporting of accidents and the development of a statistical accident database at international level, and to make this systematic.*

The AEGPL is very pleased that with the leadership and initiatives of the French ministry this work is now in progress, but this work must be advanced rapidly to provide the benefits as above.

Before any decisions are taken, the working group must ensure that it has addressed fully all the points of the mandate that was given from the Joint Meeting to the ad hoc RID/ADR BLEVE prevention working group

The BAM study, BLEVE tests & Report

The AEGPL has received very recently an advanced copy of this report (with a large part in German language) and although this has not been yet fully analysed, we would like to make a number of observations.

While we are sure that the tests were well managed and professionally recorded, we still cannot identify in the testing programme and resulting information provided exhaustive answers to some of the issues specified in the scope of the study. The core scope of the more general mandate, to consider measures to prevent the incidents of BLEVE together with reducing the effects does not appear to be comprehensively addressed by the range of tests performed by BAM.

More particularly, below details of the areas that we consider that have still not been covered fully yet:

A testing programme should have been produced by Germany and BAM to include the following amongst others:

1. *Definition of the conditions of a representative pool fire*

While a defined pool fire configuration and intensity was selected for the tests, this has not been justified or demonstrated as “representative”, as it had been requested, to reflect real accident situations. The immediate and full intensity fire, the immediate full tanker engulfment in this fire and the 75KW/m² fire intensity in our view does not represent a typical or most commonly observed (representative) fire situation from past accidents, but rather a reproducible worse case situation.

2. *Description of the criteria for the selection of the coatings to be tested*

This information was not found in the delivered reports, no description of the criteria was found

3. *Description of the criteria for the selection of the safety valves to be selected, including evaluation of negative effects of safety valves (e.g. heat radiation)*

No description of the criteria has been seen/presented so far (number, size, capacity, standards), this information was not found in the delivered reports

4. *Evaluation of the tests already performed by BAM, TNO and of tests described in literature, which results in a list of questions not answered*

No evaluation of past tests have been seen /presented so far, this information was not found in the delivered reports. We know that many of the tests presented had been carried out earlier (2009, 2010 etc.), before the scope of the BAM study was put together, but it is not clear on what criteria these BAM tests were selected from the past.

5. *List of tests to be performed based on the not answered questions, including test priority.*

No list of the tests that were planned to be performed has been seen /presented so far.

More generally, the logic and reasoning for those specific tests to be performed (what tanks, size, standards, what coatings, what PRVs, number, size, standards and what combinations amongst them) was not presented or at least this information was not found in the delivered reports. The tanks tested were static tanks of inferior to RID/ADR standards. The only test with a tank that BLEVED (of 2009), concluded that “sufficiently dimensioned safety valves are able to limit the pressure inside the tank to such an extent that the pressure can be kept at non-critical levels”, however all subsequent tests made with propane, used significantly smaller safety valves, which we cannot understand. We believe that at least one test should have been carried out reflecting the most commonly found configuration, this of a tank without thermal coating and without PRV (as in France, Italy, Germany, Spain etc.). This should serve as a reference base for the relative improvements obtained afterwards by using thermal coating and PRVs on the tanks. We are also aware that some of

the tests appearing in the reports had been performed in earlier years and the criteria of selection of these specific test reports from the bibliography are not clear (one test was also with ethanol).

Before any decisions are taken, the RID/ADR BLEVE prevention working group should ensure that the scope of the study that was given to Germany and BAM has been fully covered and the outcome has been fully communicated to the members of the working group.

Outstanding Questions / Issues

There is number of questions and issues previously identified which have not yet been addressed fully by the working group, by the test programme and BAM report. These feature in annex 2 and 3 of the Berlin meeting report and are listed again below for completion, as remaining still outstanding or unresolved:

- *Mechanical impact (e.g. overturn, slips on road, low level falling...)*

This is a very important issue, as stated in the 2005 TNO report (INF3 doc. March 2006 RID/ADR Joint Meeting), defects in the insulation of 0.4x0.4m or larger will make the insulation ineffective.

- *Influence of tank size (transferability from small to real scale)*

Since the aim is to achieve a min. 60mins time delay before BLEVE in real Road/Rail situations, the transferability of the results and timings of the tests carried out in small static tanks to large scale RID/ADR tankers must be proven (eg it is clear that a small LPG cylinder engulfed in fire will BLEVE much quicker than a 40m³ road tanker)

- *Qualification of the coating procedure (e.g. which coating can be used, art of application, minimum of thickness...)*

It is known that the types of thermal insulation used so far in the few cases known (Netherlands and Hong Kong for toad tankers, USA for rail tankers) rely on completely different technologies. This emphasizes once more that a single proven technology, free of negative aspects has not been found yet and that the type of coating, application procedure, thickness etc. are absolutely key.

- *Qualification of workmanship to achieve a unique level of quality resistance of coating (e.g. long term stability, handling, Weather conditions.....)*

- *Installation of a pre warning system relating to failure is it possible to realize?*

A very valuable pre-warning system is the pressure relief valve (PRV) when a tank is on fire. Other systems need to be investigated also. Temperature measurement of the tank shell by thermal imaging is also a valuable pre-warning system (which becomes unusable with thermal coating).

- *It is necessary to develop codes and standards*

Also,

- *To get a better view and/or references on fire testing conditions*

- *Model to be studied to transfer tests results from small static (3m³) to bigger RID/ADR tank (40/60 m³ for road up to 120 m³ for rail)?*

- *Mechanical impact (e.g. overturn, slips on road, low level falling...): what happens if part of the coating is removed?*

- *Resistance of coating (e.g. long term stability, handling, weather conditions.....)*

- *Check the effectiveness of the coating in time*

- *Design of PRV's (to be check for use in fire condition)*

- *Share some views about the current requirements set out in special tanks provisions TP6, that already requires PRV's should be installed in such a way to avoid rupture of the shell in case of fire engulfment and how is done that in practice*

- *Therefore it is necessary to develop codes and standards*

Before any decisions are taken, and any further proposals are tabled, all the remaining questions from the work carried out by the RID/ADR BLEVE prevention working group and by BAM must be answered satisfactorily.

Conclusion

For all these reasons the European LPG Industry urges extreme caution by the RID/ADR and associated groups when discussing the thermal coating mitigation measure. The European LPG Industry has a long history of good cooperation with RID/ADR and together we can be proud of the current safety performance of the LPG industry in Europe. We would like to see this work continue and look forward to further discussions relating to BLEVE prevention.

Therefore for the time being making a decision based on the elements communicated so far seems to be premature.