Economic Commission for Europe
Inland Transport Committee
Working Party on the Transport of Dangerous Goods

Ninety-first session
Geneva, 8–11 November 2011

Item 4 of the provisional agenda

Work of the RID/ADR/ADN Joint Meeting

Outcome of the Joint Meeting RID/ADR/ADN – Transport in tanks of UN 0133 – Test reports
Test Report

Evaluation of the behaviour of ammonium nitrate emulsion in a modified vented pipe test in an aluminium container*

Applicant: MSW Chemie GmbH
Seesener Str. 19
38685 Langelsheim

Application date: 10th November 2004
Test ref: II.3/5135/04
Substance to be tested: Andex LD Explosive
Test: Modified Vented Pipe Test in an Aluminium Container*)
Test date: 2004-12-02
Test site: BAM Testing Grounds, Horstwalde
Attendees: Dr. Breidung, Mr Pissin from MSW Chemie GmbH
BAM Test Team, Division II.3

*) The test was conducted in accordance with Australia’s proposal in Annex 1 of the UN document UN/SCETDG/21/INF.69 (21st Session of the Sub-Committee, July 2002).

The test was not ended until no further reaction was recognisable from the test substance.

The container was filled with 23.3kg of test substance, reaching a height of 450mm.

The temperature was measured with thermo-elements in the container approx. 80mm above the bottom and in the gas flame under the container and was recorded.

Deviations from the test regulations with justification:

An aluminium container with an external diameter of 310mm and external height of 600mm was used instead of a steel container. The opening in the lid had a diameter of 75mm. The container had a wall (and lid and bottom) thickness of 5mm. The container was made from an aluminium sheet and had a longitudinal weld joint of the same quality as aluminium transport tanks. The bottom and the lid were welded on with the same quality.

Test Results:

<table>
<thead>
<tr>
<th>Occurrences/Observations:</th>
<th>Time in minutes</th>
<th>Time in seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ignition of the gas flame</td>
<td>00:00</td>
<td>0000</td>
</tr>
<tr>
<td>Smoke begins to emerge from the container’s opening</td>
<td>13:55</td>
<td>0835</td>
</tr>
<tr>
<td>Flames</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ejection of burning substance</td>
<td>From 35:45</td>
<td>2145</td>
</tr>
<tr>
<td>Ejection of non-burning substance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discharge of non-burning substance</td>
<td>To 38:45</td>
<td>2325</td>
</tr>
<tr>
<td>Last strong discharge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoke emerging from substance outside the container</td>
<td>To 43:15</td>
<td>2595</td>
</tr>
<tr>
<td>Gas off</td>
<td>47:00</td>
<td>2820</td>
</tr>
</tbody>
</table>

After the test, it was found that the bottom of the container was torn open and partially melted. There was little solidified substance or ash from burned substance found beside the test set-up.
Conclusions:

The behaviour of the tested explosive and the aluminium tank verifies that Andex LD may be transported in an aluminium tank without quantity limitation.

Berlin, 26th January 2005

[Signature]

Dipl.-Ing. Werner Franke
Working Group "Explosives and Propellants"
Division II.3 "Explosives".

Enclosures:
Picture documentation
Temperature progression
Photographic Documentation of the Tests

Test Ref: II.3/5135/04

Annex to the test report for the company: **MSW Chemie GmbH**

Tested substance: Explosive Andex LD, 23.3kg in an aluminium container.
UN Test: Modified Vented Pipe Test in an Aluminium Container
Date: 2004-12-02  Location: Horstwalde

Ill. 1
Aluminium container

Ill. 2
Lid

Ill. 3
Bottom

Ill. 4
Test set-up

Ill. 5
Thermo-element for measuring the inside temperature

Ill. 6
Initial flames

Ill. 7
Ejection of burning substance
Annex to the test report for the company: MSW Chemie GmbH

III. 8
Ejection of non-burning substance

III. 9
Discharge of non-burning substance

III. 9
Last strong discharge

III. 10
Test set-up after completion of the test

III. 11
Lid with thermo-element

III. 12
Bottom torn open
Details on graph:

“Im Rohr - 80mm über dem Boden” > In the pipe - 80mm above the container bottom
“Im Feuer” > In the fire
“Zeit in Sekunden” > Time in seconds
“Temperaturverlauf - MVPT” > Temperature progression - MVPT
“Alu-Behälter, Andex LD, Fa. MSW” > Aluminium container, Andex LD, Company: MSW
Test Report

Evaluation of the behaviour of Andex LD in a modified vented pipe test with a steel pipe *

Applicant: MSW Chemie GmbH
Seesener Str. 19
38685 Langelsheim

Application date: 11th July 2005
Test ref: II.3/2595/05
Substance to be tested: Andex LD Explosive
Test: Modified Vented Pipe Test with Steel Pipe*
Test date: 2005-10-19
Test site: BAM Testing Grounds, Horstwalde
Attendees: Mr Pissin from MSW Chemie GmbH
BAM Test Team, Division II.3

*) The test was conducted in accordance with Australia’s proposal in Annex 1 of the UN document UN/SCETDG/21/INF.69 (21st Session of the Sub-Committee, July 2002).

The steel pipe was 580mm high and had a wall thickness of 5mm. The bottom and the lid were made of 6mm-thick steel sheet and were welded on using a fillet weld.

The pipe was filled with 17.8kg of test substance, reaching a height of 440mm.

The temperature was measured with a thermo-element in the pipe approx. 80mm above the bottom of the pipe and was recorded.

**Deviations from the test regulations with justification:**

The steel pipe had an external diameter of 265mm. The deviation when compared to an inner diameter of 265mm (not available in Germany) is not very much.

The opening in the lid had a diameter of 75mm. The 87mm figure, which is given in the above-mentioned proposal in square brackets, is replaced by the figure for the US vented pipe test, which is currently given in the UN handbook. The lower figure gives additional certainty.

The test was not ended until no further reaction was recognisable from the test substance.
Test Results:

<table>
<thead>
<tr>
<th>Occurrences/Observations</th>
<th>Time in minutes</th>
<th>Time in seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ignition of the gas flame</td>
<td>00</td>
<td>0000</td>
</tr>
<tr>
<td>Smoke begins to emerge from the lid’s opening</td>
<td>14</td>
<td>0840</td>
</tr>
<tr>
<td>Emission of melted substance</td>
<td>From 33.5</td>
<td>2110</td>
</tr>
<tr>
<td>Combustion of the melted substance running down</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extinguishment of the flames (melted substance)</td>
<td>To 38.75</td>
<td>2325</td>
</tr>
<tr>
<td>Discharge of melted substance and gas-based decomposition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>products (smoke)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Last strong smoke discharge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoke emerging from the pipe and from substance outside</td>
<td>To 45:50</td>
<td>2730</td>
</tr>
</tbody>
</table>

The pipe was empty after the test. The pipe, with its bottom and lid, was undamaged. Ash from burned substance and solidified melted substance were to be found beside the test set-up.

Conclusions:

The behaviour of the tested explosive in the steel container verifies that Andex LD is suitable for transport in a steel tank.

Berlin, 23rd November 2005

[Signature]

Dipl.-Ing. Werner Franke
Working Group “Explosives and Propellants”
Division II.3 “Explosives”.

Enclosures:

Picture documentation
Temperature progression
Photographic Documentation of the Tests

Test Ref: II.3/2595/05

Annex to the test report for the company: MSW Chemie GmbH

Tested substance: Explosive Andex LD, 17.8kg in a steel pipe.
UN Test: Modified Vented Pipe Test in Steel Pipe
Date: 2005-10-19 Location: Horstwalde

III. 1
Test set-up

III. 2
Lid of the filled pipe

III. 3
First melted substance runs over

III. 4
Burning melted substance at the top and bottom

III. 5
Ejected melted substance, burning

III. 6
Ejected melted substance, decomposition products
Ill. 7
Ejected melted substance, decomposing

Ill. 8
Ejected melted substance, decomposing

Ill. 9
Discharge of nitrous gases

Ill. 10
Last strong smoke discharge

Ill. 11
Test set-up after the test

Ill. 12
Lid
Ill. 13
Lid and wind guard with left-over substance at the bottom of the test set-up

Ill. 14
Cinders (combustion product)
Details on graph:

“Zeit in Sekunden” > Time in seconds
“Andex LD im Stahlrohr - MVPT” > Andex LD in a steel pipe - MVPT
“Start bei ca. 35s” > Start at approx. 35 seconds.
Test Report

Evaluation of the behaviour of Andex LD in a modified vented pipe test in an aluminium container*)

Substance to be tested: **Andex LD Explosive**
Test: Modified Vented Pipe Test in an Aluminium Container*)
Test date: 15th November 2007
Test site: BAM Testing Grounds, Horstwalde
Attendees: Representatives of K+S AG, MSW Chemie GmbH and DeuCon and the BAM Test Team, Division II.3

*) The test was conducted in accordance with Australia’s proposal in Annex 1 of the UN document UN/SCETDG/21/INF.69 (21st Session of the Sub-Committee, July 2002).

The test was not ended until no further reaction was recognisable from the test substance.

The pipe was filled with a total of 22.2kg of test substance, reaching a height of 450mm.

The temperature was measured with 3 thermo-elements in the container approx. 5, 22 and 51.5cm above the bottom of the container and was recorded.

**Deviations from the test regulations with justification:**

An aluminium container with an external diameter of 310mm and external height of 600mm was used instead of a steel container. The opening in the lid had a diameter of 26.3mm. The container had a wall (and lid and bottom) thickness of 5mm. The container was made from an aluminium sheet and had a longitudinal weld joint of the same quality as in aluminium transport tanks. The bottom and the lid were welded on with the same quality.

**Test Results:**

<table>
<thead>
<tr>
<th>Occurrences/Observations</th>
<th>Time in minutes</th>
<th>Time in seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ignition of the gas flame</td>
<td>00</td>
<td>0000</td>
</tr>
<tr>
<td>Smoke begins to emerge from the lid’s opening</td>
<td>15</td>
<td>0900</td>
</tr>
<tr>
<td>Melted substance runs out of the opening over the edge and is combusted.</td>
<td>44</td>
<td>2640</td>
</tr>
<tr>
<td>Strong smoke emission from the opening together with ejection of melted substance</td>
<td>47</td>
<td>2820</td>
</tr>
<tr>
<td>End of smoke discharge</td>
<td>52</td>
<td>3120</td>
</tr>
<tr>
<td>The bottom of the container bulges</td>
<td>53</td>
<td>3180</td>
</tr>
<tr>
<td>The bottom of the container opens</td>
<td>53:30</td>
<td>3210</td>
</tr>
<tr>
<td>End of the reaction</td>
<td>62</td>
<td>3720</td>
</tr>
</tbody>
</table>

The bottom of the container was partially melted after the test. Ash from burned substance and solidified melted substance were to be found beside the test set-up.
Conclusions:

The ratio of the size of the opening in the aluminium tank to the volume of the tested substance corresponds to that of openings in the transport tanks to the volume of the transported explosive.

The behaviour of the tested explosive and of the aluminium container verifies that Andex LD is suitable for transport in an aluminium tank without quantity limitation.

Berlin, 11th April 2008

[Signature]

Dipl.-Ing. Werner Franke
Working Group “Explosives and Propellants”

Enclosures:
Picture documentation
Temperature progression
Photographic Documentation of the Tests

Annex to the test report for the company: **MSW Chemie GmbH**

Tested substance: Explosive Andex LD, 22.2kg in an aluminium container.

UN Test: Modified Vented Pipe Test in an Aluminium Container

Date: 15th November 2007          Location: Horstwalde

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**III. 1**
Aluminium container

**III. 2**
Test set-up

**III. 3**
Insertion of the thermo-elements to measure the temperature inside

**III. 4**
Lid

**III. 5**
Ignition of the gas flame

**III. 6**
Propane burner
Overflowing combusted substance

Strong smoke discharge from the opening

The bottom of the container bulges

The bottom of the container bulges

Opened container bottom

Container after the test
Annex to the test report for the company: MSW Chemie GmbH

III. 13
Opened container bottom

III. 14
Lid following the test

III. 15
Opened container bottom
Details on graph:

"über dem Boden" > From the bottom of the container
"Zeit in Sekunden" > Time in seconds
"Temperatur-Zeit-Verlauf" > Temperature progression over time
"Fachgruppe II.3" > Division II.3