DRAFT REPORT

2nd meeting of the GRSG informal group on

the introduction of plastic glazing for windscreens and laminated plastic panes other than windscreens in UN/ECE Regulation N°43

Venue: KRD Sicherheitstechnik GmbH/ KRD Coatings GmbH
Vierlander Straße 2
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Germany

Chairman: Dr. Klaus Preuβer (D) (dr.klaus.preusser@t-online.de)
Secretariat: Mr. Olivier Fontaine (OICA) (ofontaine@oica.net)

Dates: Tuesday, 14 June and Wednesday, 15 June 2011

Attendees:

ACKERMANN, Doris	OICA/Opel
BERTHET, Florence	OICA/Renault
BIERENS, Mark	Delta Glass BV
BOELAERTS, Olivier	Vinçotte International
BOURRIGAUD, Sylvain	Arkema
BOUTILLIER, Jean-Marc	Arkema
Dr. BUCKEL, Frank	Bayer Material Science
Dr. DÜMMLER	MPA NRW
ESSER, Matthias	OICA/Daimler
FONTAINE, Olivier	OICA
HARA, Junichi	JASIC Japan
HAVU, Jouni	John Deere
HELMICH, Gerd	Pilkington
KANJI NANJI, Anis	PSA Peugeot-Citroën
LANG, Andreas	Webasto AG
NAWROTH, Manfred	Bayer Material Science
Dr. PREUSSER, Klaus	Germany
RANSONE, Brigitte	Saint-Gobain
REINHART, Klaus	KRD
ROSENKRANZ, Mark	John Deere
SAWADA, Tomotaka	JASIC
SAX, Bernhard	Sabic
SCHMIDT, Sebastian	Freeglass GmbH
Dr. SCHMITZ, Jürgen	KRD
TERRAGNI, Matteo	Sabic
WAGNER, Gottfried	KRD
YAMAKAWA, Takehisa	OICA/JAMA
ZAFARI, François	Altuglas International

1. Welcome and Introduction

Mrs. Korinna Brammer, as KRD CEO, and Dr. Schmitz, Quality Manager by KRD, welcomed the participants to the second meeting of the GRSG informal group on plastic glazing (GRSG-IGPG).

2. Approval of the agenda

Document: IGPG-02-01 (Chair)

The agenda was approved with no modification.

3. Revision and approval of the draft minutes of the 1st meeting

Document: IGPG-01-07 (Secretariat)
IGPG-01-07-Rev.1 (Secretariat)

Mr. Terragni (SABIC) requested some changes in chapter 5, in order to clarify his presentation of the document IGPG-01-05. He also added some changes in chapter 6.3., clarifying the intervention of Mrs. Paull.

This revision was accepted and the informal group adopted the revised report of the 1st informal group meeting per document IGPG-01-07-Rev.1, distributed in hard copies during the meeting.

4. Results of the outcome of the Task-force conducting the round Robin test for the Taber test

Documents: IGPG-02-02 & Rev.1(Bayer)
IGPG-02-03 (Taber Industries)
IGPG-02-04 (Taber Industries)
IGPG-02-05 (Bayer)

Dr. Buckel presented in detail document IGPG-02-02-Rev.1 as a completed version of the document IGPG-02-02 providing the results of the Taber Round Robin test.

Mr Terragni (Sabic) firstly informed that the timing was not the reason why his company did not provide samples, rather a company decision (reference to the statement in 3rd paragraph of page 2 of document IGPG-02-02).

J provided information about their wheels (CS-10F for generations 1 to 4; Daiwa C180 0FX) and comparison test. The delegate from J informed that these results were presented the week before at the ISO group in Detroit. The generation N°1 CS-10F wheel (expired in 2002) produced similar results according to the time compared to the Daiwa C180 0FX.

The experts were also informed about the ISO Round robin test currently conducted and addressing Daiwa wheels for plastics and glass. It was suggested that the IGPG refers to ISO, but the experts acknowledged that the timeframe does not permit to do this. ISO will probably compare the wheels from Daiwa and Taber.

4.1. Reproducibility of the current Taber test method

MPA informed that they got results of haze of 4 – 15 – 2 % according to the wheels they used in the Taber test. The expert was of the opinion that only some discrepancies in the wheels themselves could explain that and was keen that Taber provides information about their wheels. The expert added that in his opinion, it would be too soon for the time being to delete this test from the list of tests to be performed.
The Chair suggested that another company provides wheels.

Vinçotte also was disappointed that the protocol/guidance was not well defined for performing the Taber test and was of the opinion that this could be one of the reasons of the variance they found in the tests.
Dr. Buckel explained that only 2 protocols do exist for the Taber test and that it should have been simple to choose one of them. Dr Buckel showed the comments sent by Mr. Jaenecke per document IGPG-02-04, with his recommendation. Points 1, 2 and 3 address the instrument itself and the results show that item 5 (haze measurement) does not apply to the case of the round robin test conducted by the informal gr. Item 4, vacuum section, could however be a reasonable source of variance.

Mr. Terragni strongly stressed that there is a need for a clear procedure which is reproducible for the regulation. Dr. Buckel however found difficult to improve the situation as all the details are already well described in the ASTM procedure. He recalled that some labs cannot perform another procedure as they are accredited to one procedure (e.g. ECE R43) and not for another one.

A debate then took place about the way to proceed.
Dr. Buckel showed slide N°19 of IGPG-02-02-Rev.1, showing the possible options forward.
Mrs. Ackermann (OPEL) suggested acting in 2 steps: adding a new test for plastic glazing as the time does not permit to improve the Taber test, and then improve the Taber test.
Dr. Schmitz recommended anyway to keep the performance requirement of 2%haze.
It was pointed out (Mr. Helmig - Pilklinton) that there is a lack of experience with the other tests. At least GM and Bayer do currently perform the Amtec-Kistler test (Daimler to check internally).
The Chair summarized that the Taber test seems not accurate enough for testing the plastic material. The problem was raised that the wheel producers do not want to share the formulae of their wheels, while ideally the composition should be known.
Typical scratches from the Taber test were shown on the screen (coming from Vinçotte International)

Mr. Jaenecke (Taber Industries) subsequently took part to the meeting via a phone conference:

1. Nozzle opening: it appears that two labs did not open up the nozzle enough
2. Wheel bearings wear could make the wheels not perpendicular to the surface. Some equipment used for the round robin test are 30-40 years old and Taber has no trace of calibration of these equipment. Even knowing that some labs in Europe have accreditation to service the equipment, the question remains whether they are well calibrated.
3. Cleaning procedure can influence the results. An anti-static brush can clean the sample w/o adding dusts. A too hard brush can scratch the dust.

MPA had a concern that the wheels they used for the round robin test may have had a problem because they provided results of 14% haze while the out-dated wheels (out-dated in March 2011) did provided the expected result of 4%.
Bayer expected the abraded track to show the lack of calibration of the instrument. One test could be to reverse the test piece in order to see whether the piece itself can have deformation. Seeing well abraded tracks does not mean that the equipment is well calibrated, while the inverse is true.

Mr. Jaenecke proposed to make available a calibration kit to be passed on to the test houses.
Mr. Jaenecke also presented his understanding of the hardness differences measured by two of the labs. He stressed that the procedures are different each sides of the ocean (Shore A vs. IRHD).

Mr. Jaenecke kindly made himself available for any request from any expert to the group.

The experts further discussed the appearance of the test tracks and convened to check them again. All agreed to send the samples back to Taber Industries to check the quality of the test track.

Conclusion: Taber Industries calibration kit to be passed on to the test houses in order to improve the reproducibility of the test.

4.2. Clarification and completion of the Taber test method

Some debate took place about the cross scratches as representative of the real world usage (car wash, ice scraper, sand blast, etc.). Some video showed (Sabic and Bayer) that ice does not adhere to PC surface hence makes ice scratching less relevant than for glass.

It was considered whether performing another round Robin test, with the target of knowing whether the variability is due to the material itself or to the test, and with the knowledge of the definition of the wheels (same wheels from Taber) and a precise test procedure. In order to get comparable results, the same wheels and instruments (and calibration) should be used for all labs, procedure and wheel description. It was suggested to conduct measurements after 100, 200, etc. cycles and recommended to establish a proper strategy according to the results.
Some expert raised the issue of the relevancy of the Taber test for the glass itself as the current windscreens can be replaced quite often as well. The Chair informed about a study conducted in Germany on windscreens used on passenger cars for 100,000 to200,000 km. Dr. Buckel also stated that all glass always have met the Taber test, hence there is no evidence that the Taber test is the proper one for glass. No expert had an idea of the origin of the 2% pass/fail value.
The idea was presented that the windscreen could be considered as a replaceable component.
Mr. Yamakawa (JAMA) informed about GRSP where different dummies provide different results, and where the experts decided to set up a guideline document for the dummies. If no compromise could be found, the informal group could ultimately ask guidance to GRSG.
UNECE R22 (protective helmets) could be a good source of inspiration for reference abrasion materials.

5. Decision about the relevant abrasion test(s)

Document: IGPG-02-07 (NSG – Pilkington)

The expert from Pilkington presented the document IGPG-02-07.

The group in general was of the opinion that other test procedures should be investigated additional to the Taber test. It was also decided to watch the results of the ISO working group.

Bayer presented the results of their investigation about the possible relevant abrasion tests (document IGPG-02-05). The Technical Services confirmed it is possible to perform some of the proposed test methods.
An additional option was proposed as keeping the Taber test, and adding another relevant one for the plastic glazing. Some ideas were proposed to combine a less severe Taber test (500 cycles) with e.g. car wash test. The Chair recalled in this view document IGPG-01-06 where J proposed some successive tests on the same sample.
The Secretary informed that UNECE regulations are always possible to amend and improve if the necessity appears. OPEL supported this statement and suggested adding the Taber test at a later stage.

The Chair suggested having a closer look to the sand drop test and the Amtec-Kistler test and the proposal raised to organise two round robin tests for those tests:

<u>Sand drop test</u>

- Companies with equipment for sand drop test are Bayer, MPA, Opel(?), Pilkington(?) and Daimler.
- Information about the equipment must be provided, for the sand drop itself as well as for the haze measurement.
- Dr. Dümmler (MPA) to lead the task force.
- Samples to be delivered by Bayer, Pilkington, Polyplastic. (50 X 50 mm)
- Results expected for November meeting (IGPG-03)

Car wash (Amtec-Kistler)

- Companies with equipment for car-wash are Bayer, Opel, Renault (?), Darmstadt Universität(GFTN, Prof May), Daimler(?), JAMA (?), VW (?)
- Samples to be provided by Bayer, Pilkington, Polyplastic
- Dr. Buckel (Bayer) to lead the task force.
- Results expected for November meeting (IGPG-03)

Conclusion:

- Setting up of a task force evaluating the "sand drop" test
- Setting up of a task force evaluating the "Amtec-Kistler" test
- Each task force to provide their results for the 3rd meeting of the informal group (21-22 November 2011, Leverkusen - D)

6. Revision of the results of the laboratories internal inquiry about the resistance to temperature change test

The group deplored that TÜV Süd and UTAC were not present.
Dr. Buckel informed that the above labs are not expected to perform the tests.

Vinçotte informed that they performed the temperature cycles, but did not perform the abrasion as they were waiting for the outcomes of the discussions on the Taber test at the present meeting, in view of the results of the Round Robin test. The expert was keen to receive an accurate procedure for performing the Taber test.

Relating to the mechanical test (height of drop), Vinçotte did not receive any samples. Bayer is expected to provide samples in the course of the summer; delay is due to the moving of the Bayer facilities to Leverkusen.

Conclusion:

- Recommendation to perform the tests and contact another lab if necessary to confirm the results.
- Results for both tests are expected for the November meeting.

7. Presentations of plastic glazings in vehicles and components in current production

Presentation of John Deere forestry tractor cab: the presentation aimed at informing the experts that forestry tractor manufacturers need some clear regulation: forestry tractor manufacturers currently have to comply with different standards and national regulations, but would welcome one comprehensive regulation to comply with, which could permit them to homologate their vehicles once and sell them in all markets (regulatory harmonisation).

Police vehicles were presented as well, equipped with plastic glazing. One vehicle had a mileage of about 130.000 km.

Visit of the KRD production chain.

- Laminated plastic shields: handmade laminated are assembled under a well-controlled atmosphere. The group had the opportunity to witness the production steps of laminated panes composed of three layers, and formed thanks to a glass pane.
- Coating:. The group could witness the coating of plastic panes. This coating is performed under controlled atmosphere, and after the pane was ventilated by ionised air in order to avoid static electricity. Then the pane is being dried during several hours.
- Test of resistance to shocks: the experts also witnessed a drop test (weight of 10kg and height of 6 m), according to the performance requirements of the customer.

8. Update of the other test procedures

Regarding the proposal from the European Commission to perform the demist defrost test, GM was of the opinion that such new test should be integrated in a new ECE regulation because the UNECE Regulation 43 is a component regulation rather than a vehicle regulation.

9. Principle of "re-testing"

Conclusion: the informal group agreed to re-introduce the pass rate in the regulation.

10. Further discussions of the draft regulatory text

Document: ECE/TRANS/WP.29/GRSG/2009/8 (D)

Headform test (para 4)
A debate took place about the number of windscreens to be provided. The Chair explained that the proposed number of 6 windscreens refers to the number originally requested for flat pieces of glass in the regulation. It is difficult to produce flat plastic panes of the dimension requested by the current wording of the regulation; hence the Chair suggested 6 pieces of real windscreens. Purpose of the proposed test is to assess the mechanical strength. Conclusion: proposal for 6 windscreens adopted, with proper justifications. HIC of 1000 was accepted

227 g ball test (paragraph 5)
A debate took place about the procedure.
Concerning the number of samples, the group agreed that at least 8 separate tests must give satisfactory results.
Conclusion:

1. the group agreed that the ball drop test should be performed after the humidity test
2. and the ball drop test should be also performed on samples with a temperature of – 18° C

Taber test (paragraph 6.1.)
See paragraph 4 above

Weathering test (paragraph 6.2.)
A debate took place about the intensity of the radiation which could be relevant. It was suggested that the level should not be more than 0.5 Watt/m² with 340 nm wavelength, these figures coming from some experience conducted 10 years ago. However, there is no certainty that all test houses are able to test at these values.
Number of samples: as the test takes about several weeks, it is suggested to provide 3 samples. The experts informed that they never experienced large variations.
Pass rate: 100% (deletion of paragraph 6.2.4.2.)

Cross-cut test (paragraph 6.3.)
Pass rate: 100% (deletion of paragraph 6.3.3.2.)

Resistance to humidity test (paragraph 6.4.)
It was recalled that this test can make sense in the case of coating and that this test was originally developed for laminated glass where some humidity could "de-laminate" the sample. The experts were all of the opinion that the test is not of high importance. However it was considered so easy to conduct that it makes no pain to keep it.

Fire resistance test (paragraph 6.5.)
The Chair recalled the proposal from CLEPA (document GRSG-100-04) to harmonise the performance requirement (to 90mm/min), and his reluctance at that time (keeping the value of 110 mm/min).
The group was informed that some flexible plastic glazing however can reach a value of about 90mm/min.
Conclusion: proposed value of 110 mm/min to be kept.

The group could not investigate the following tests (i.e. resistance to chemicals and optical qualities) due to lack of time.

11. Conformity of Production (COP) measures

Not discussed

12. List of action items for next IG meeting

- **Dr. Dümmler** (MPA) to lead the task force on sand drop test
  - **Opel** to inform about available facilities
  - **Pilkington** to inform about available facilities
  - Samples to be delivered by **Bayer**, **Pilkington**, **Polyplastic**. (50 X 50 mm)
  - Results expected for November meeting (IGPG-03)
- **Dr. Buckel** (Bayer) to lead the task force on Amtec-Kistler test
  - **Renault** to inform about available facilities
  - **Daimler** to inform about available facilities
  - **VW** to inform about available facilities
  - **JAMA** to inform about available facilities
  - Samples to be delivered by **Bayer**, **Pilkington**, **Polyplastic**.
  - Results expected for November meeting (IGPG-03)
- **Mr. Jaenecke** (Taber Industries) to provide calibration kit
  - **Dr. Buckel** (Bayer) to manage the calibration tour
  - Kit to be passed on to test labs following email instructions distributed by Dr. Buckel on 20 June 2011
- **Vinçotte** to perform abrasion test on the samples which were subject to former temperature cycles. Results expected for the 3rd meeting of the informal group (November 2011)
- **Bayer** to provide proper samples to Vinçotte, then **Vinçotte** to perform height drop test. Results expected for the 3rd meeting of the informal group (November 2011)

13. Schedule for further IG meetings.

Document: GRSG-99-25 (D)

IGPG-03 on 21-22 November 2011in Leverkusen (Bayer - Cologne)
[IGPG-04 on 6-7 March 2012 in Bonn]
[IGPG-05 on 5-6 September 2012 in Paris (OICA)]

14. Any other business

14.1. Communication from forestry machinery manufacturers

Document: IGPG-02-06

John Deere presented document IGPG-02-06 and informed about the need for some clear regulation which could permit forestry machinery manufacturers to approve their mobile machineries once and sell them in all markets (regulatory harmonisation). The expert in addition informed about the particular needs of the forestry tractor windscreens: protection of the operator + wide field of vision. Concerning the protection of the operator, the panes must withstand e.g. penetration by bullets, pieces of chain, deer horns, etc. 12 mm thick PC unfortunately does not provide proper optical performance.

14.2. Communication from Germany about comparison tests glass vs. PC

The Chair informed about some comparison tests currently conducted by the German Federal Highway Research Institute (BASt – Bundesanstalt für Straßenwesen). He informed that the aim of this test campaign is to get scientific data comparing the head impact accelerations between PC and glass material windscreens.

- Main features:
  - Tests are performed on separate panes as well as on panes mounted on the vehicle.
  - Impactors are phantom head (10,0kg) and pedestrian head (4,5 kg)
  - Windscreen materials are laminated safety glass and polycarbonate
  - 4 impact points are selected when the pane is mounted on the vehicle
- Current status of the test series:
  - Total of 40 tests currently already conducted
  - The 4 combinations (separate and on vehicle, glass and PC pane) are already partially tested
- Tests to go:
  - Polycarbonate-Windscreen tests of different thickness (7,2 or 9,2 mm)
  - Polycarbonate ”Temperature effect“ tests
  - Full test programme to be finalised in August 2011
  - Results to be presented at 3rd meeting of the informal group (November 2011)