DEKRA Automobil GmbH, Postfach 820228, 81802 München

Premium Seal Vertriebs GmbH
z.Hd. Herrn Eduard Hartl
Rieslingweg 23

74354 Besigheim

DEKRA

Niederlassung
München-Ost

Karl-Schmid-Str. 14
81829 München

Telefon (089) 316058-0
Telefax (089) 316058-33

Unsere Abteilung/Zeichen	Ihr Ansprechpartner	Durchwahl	München
222/0450 701616 **110992633**Schi (bei Rückfragen stets angeben)	Herr Nowakowski	31605830	01.07.05

Comparative prooftesting of breakdown aids Premium Seal Repair compared with latex products

Dear Mr. Hartl,

according to your order via phone dated 26.01.2005 a comparative test of breakdown aids based on latex with your product Premium Seal Repair was conducted – as described below.

The specifications of the order were send via mail dated 18.01.2005 followed by an offer via mail dated 26.01.2005.

The following specifications were available:

- Test car and tyres to choose freely
- Puncture of four tyres with a nail, diameter 6 mm
- Filling and repair of the two left tyres with Premium Seal Repair and of the two right ones with latex products
- Adjust the tyre pressure to the necessary and recommended car value with equal valve position
- Running-in of the sealing means up to 120 km/h for a distance of 150-200 km
- Disassemble all tyres, clean with water and clean the rims controlled by a stop-watch
- Clean the tools of the dealer with time record
- Laboratory inspection if the tyres treated with Premium Seal Repair can be repaired
- Professional repair of both tyres treated with Premium Seal
- Test according to ECE-R 30 after the repair with one of the tyres treated with Premium Seal.

At the afore mentioned test steps the air pressures were to document, the repair procedure and the result were to describe and the result of the ECE test with eventually negative consequences of the repaired location were to find out.

At Euromaster in Munich four used tyres for the tests were available and mounted on an Audi A4 Avant, 2,5 TDI Quattro.

14.02.2005: Mounting of tyres and treatment with Premium Seal Repair and latex products at Euromaster.

15. und 16.02.2005: Pressure measurement during the running-in phase

25.02.2005: Repair of two tyres treated with Premium Seal Repair at. Stahlgruber/training center for vulcanizers

10.03.2005: Test according to ECE-R 30 at. Stahlgruber in Poing.

1. Test data:

The tyres were mounted on steel rims on a passenger car Audi A4 Avant 2,5 TDI Quattro.

The tyre size is 205/55 R 16 radial, hoseless.

On the front axle two Pirelli winter tyres and on the rear axle two winter tyres from Continental were mounted.

After filling the tyres with air with 2,5 bar into every tyre a nail bolt with a diameter of 6 mm was completely run so that the air pressure dropped. This was done through rollover of a light metal plate with mounted nail bolt (Fotos A und B).

After depressurizing the tyres via the punctures all four tyres were treated with breakdown aid as follows:

Into the two left tyres after removal of the valve insert Premium Seal Repair was filled.

Afterwards with a special adapter developed by Premium Seal the valve insert was brought into the valve thread and the tyre was pressurized with a compressor driven by the 12-Volt-board net of the car.

This is shown on the slides C, D and E at the example of the left front tyre.

Both right tyres were treated with marketable latex products.

At the front right side via compressor the sealing means of Dunlop with name Tirefit and at the rear right side the sealing means of Continental with the name Conticomfortkit was filled (Fotos F to H).

The filling was done according to the manuals of the producers where the valve insert for the product of Continental according to the manual was not removed.
For the product of Dunlop the valve insert was removed as mentioned in the manual.

2. Drive test:

The tyres treated with sealing means were run in ca. 10 km after the treatment. Afterwards all four tyres were adjusted to the right pressure of 2,5 bar.

After adjusting the inner pressures of the tyres to 2,5 bar the tyres were driven on highways

and autobahn ca. 150 km , where in between and at the end a pressure control was done.

The test velocity of the tyres treated with sealing means during the distance of 150 km was between 60 and 120 km/h. The mix of traffic was one third city traffic, one third highway and one third autobahn.

The pressure measurements were done at 15.02.2005 about 09.00 h and at 16.02.2005 about 10.00 h after 75 km distance respectively.

At all controls an air pressure of 2,5 bar was measured which was adjusted after the treatment with sealing means.

No tyre showed a measurable pressure drop during the test drive of 150 km.

The air pressure measurement was done with a temperature compensated air pressure control device of the producer Horn with very high accuracy according to the PTB admission rules (accuracy better than 0,1 bar).

The air pressure controls are documented in the slides 01-05 of the annex.

Therefore all used breakdown aids showed their full effectiveness after run-in of a nail bolt of 6 mm diameter and complete depressurizing of the tyres.

3. Disassembly, Cleaning and x-ray inspection:

After the test drive the tyres were disassembled in order to inspect the residues of the sealing means at tyres and rims.

Foto 06 shows the wetting of the rim front left with Premium Seal. Because the sealing means has a relative high viscosity only a defined wetted surface of the rim in the region of the rim and the rim deep bed was seen (Foto 06).

The rim could be cleaned easily with a paper towel within 1 minute. The cleaned rim is shown at Foto 07.

The rim rear left side which was wetted with Premium Seal (light green), too, showed nearly no sealing means residues in the deep bed (Foto 08). Cleaning with a paper towel was in less than 30 s possible.

The rim rear right side showed after disassembly of the tyre significant fluid residues of latex means of the producer Continental (Fotos 09 and 10). Caused by the low viscosity of the sealing means there dropped immediately sealing means onto the mounting surface of the mounting machine (Foto 11).

At the rim front right side treated with latex sealing means from Dunlop a significant wetting of the rim surface with sealing means was noticed, too. Caused by the low viscosity the sealing means run down over the inner rim horn and dropped onto the mounting plate of the mounting machine (Fotos 12-14).

Through this the mounting machine was partly heavily soiled by latex sealing means.

The cleaning of the rims soiled with sealing means was done with paper towels, too. But it was a significantly higher time between 3 and 4 minutes necessary.

Espacially important was the cleaning of the bulge seats from latex means in order to avoid possible leakages during a later assembly. The cleaning of the rims is also specified by the WdK guidelines.

The cleaning of the mounting machine took also 3 to 4 minutes.

The tyres right side front and rear treated with latex sealing means are documented on the slides 15-18.

In both cases a bigger volume (nearly the filled volume at the breakdown removal) of latex milk was found. Through the low viscosity the sealing means run over the tyre bulges and the tyre outer flanks (Fotos 15-18).

The slides 19-22 show the two left tyres treated with Premium Seal Repair.

Caused by the higher viscosity the sealing means adheres mainly at the inner side of the tyre, mainly below the tread.

Only small volumes were on the tyre bulge soles via dispersion.

After disassembly the tyres were cleaned. All four tyres were flashed with a garden water hose.This cleaning is shown on the slides 23-26 (product Premium Seal Repair) and on the slides 27-31 (latex products Dunlop und Conti).

The cleaning of all four tyres with water needed a time of ca. 4-5 minutes, no matter if the tyres were treated with Premium Seal Repair or with latex products.

The higher time effort was caused by shaking and tipping of the tyres and several times wipe out in order to get the water out of the inner tyres.

Following the cleaning and after drying of the tyres a x-ray inspection was conducted.

The damages in the region of the tread and the belt caused by the run-in 6 mm nail bolt are documented on the slides W, X, Y und Z in the annex and with green circles marked.

At both front tyres of Pirelli significant damages of the steel cord fabric of both belt layers was noticed. The steel cord was deformed and partly cut. The reason is that Pirelli uses a relative filigree steel cord fabric in the region of the belt.

On both rear tyres (producer Continental) only slight deformations of the steel cord fabric between the cords at the nail stitches were noticed. The reason is that this producer uses a less filigree steel cord fabric and the bolts are in our case only penetrated through the cords.

Caused by the high elasticity of the vulcanized material the perforations close nearly completely where the deformed steel cords are nearly forced back into their original positions (x-ray slides X und Z).

The x-ray pre test was conducted via a monitor shown on slide 32 in the annex.

The external visible punctures of the nail bolt are shown on the slides 33 and 34 from the outside and from the inner side (tyre front right), 35 and 36 (tyre front left), 37 and 38 (tyre rear left). At the tyre rear right the picture was identical to the picture at the tyre rear left.

4. Repair of the tyre front left side:

According to the x-ray inspection the tyre font left side showed the most significant damage of the two steel belt layers. Therefore this tyre was professionally repaired at the Stahlgruber-training center.

The excerpt from the repair guidelines is documented on slide 39.

Because all four tyres have the velocity category „H“ (V-Max = 210 km/h) a repair is only allowed for perforations up to 6 mm expansion.

A damage showed on a training example of Stahlgruber with an expansion of 8 mm is according to the repair professionals not repairable, this repair should be denied (Foto 40).

At the tyre front left side an expansion of the perforation of nearly 8 mm was seen. Therefore it is a borderline case of repairability (Foto 41).
The repair was done with a professionally released Minikombi A 6 which is documented on the slides 42 and 43.

The location for repair is at the inner side of the tyre treated with a liquid buffer and roughed with a grating tool and afterwards finished with a mill.

The roughed location is sharpened and sucked in. This is shown on the slides 44-49.

The prepared repair location with a milling of 6 mm diameter is shown on slide 50.

The Minikombi mushroom and the roughed inner surface are raked in with a spezial cement (Fotos 51-53).

Afterwards the Minikombi is pulled through the milled bore until the foot of the mushroom lies smooth at the inner surface of the tyre and is glued. This is shown on the slides 55-58.

Afterwards the foot of the Minikombi is rolled with a knurl (Foto 59).

This professionally repaired tyre was afterwards subjected a test according to the European guideline ECE-R 30.

5. High velocity testing according ECE-R 30:

The test conditions according ECE-R 30 are presumed as known.

Because the tyre has the velocity category „H“ the tyre was driven in during 10 minutes after conditioning, then driven in the first stage for 10 minutes with 180 km/h, in the next stage for

10 minutes with 190 km/h, in the third stage for 10 minutes with 200 km/h and in the last stage for 20 with 210 km/h.

Afterwards the tyre was tested in addition for 10 minutes with 220 km/h on the drum.

The distance of this test was 193,5 km on a 2 m drum of the high velocity testing machine of Morenga.

The tyre was loaded with a test load of 492 kg, this corresponds caused by the drum curvature to 80 % of the maximum load of the tyre.

The test tyre pressure was 2,5 bar that means an aggravation compared with ECE-R 30-guideline which specifies for H-tyres 2,8 bar.

The room temperature during the test was 20 °C.

This high velocity test passed the repaired tyre front left in all velocity stages and more without detectable damages and failures.

After the test the material temperature of the tyre (stitch temperature) was measured at the tyre shoulder with 53°C and at the mid of the tread with 48 °C ca. 3 minutes after standstill of the tyre. The inner pressure of the tyre after the high velocity test was measured with 3,0 bar.

6. Laboratory examination of the tyre tested according to ECE-R 30:

After the high velocity test the repaired zone of the tyre was taken from the tyre through a cut (Foto 60).

Foto 61 shows the belt edge of the tyre without significant changes, that means no signs of a beginning belt edge loosening.

Foto 62 shows the repair location on the tyre from the inner side, significant changes or redemptions are not detectable.

From the section the two steel belt layers were separated with a surgical knife in order to expose the inner repair location. This is documented on the slides 63-65.

Stemming from the repair location only one steel cord was loosened from the belt layer composite. This steel cord was slightly stained in direct neighbourhood of the perforation as can be seen with a microscope (Fotos 64 und 65).

Therefore on the tyre front left which was punctured with a 6 mm nail bolt, treated with Premium Seal tyre sealing means, after cleaning and professional repair and after the high velocity test according to ECE-R 30 no significant effects in the region of the damage were detectable, although the repair was a border line case because the expansion (steel cord deformation up to 8 mm).

Even the according to ECE-R 30 performed higher velocity stage with 220 km/h passed the

tyre without any problems.

It was not tested if the treatment with tyre sealing means, the following repair and the high velocity test causes possible migration effects of the solvent of the breakdown aid Premium Seal. The migration may under certain circumstances affect the inner liner and therefore degrade the adhesion of the foot of the repair mushroom.

In this case under aggravated test conditions no adhesion problems were detected.

The migration of solvent could be detected through a chemical analysis if this has not been done already.

7. Check of the hoseless valves:

In the scope of the whole test the valve inserts of the hoseless valves were microscopicly examined.

At the tyres treated with Premium Seal Repair were as well front left as rear left no residues or deposits of the sealing means at the valve insert and on the sealing surfaces of the valve insert detectable (Fotos 66 und 67).

This is apparently due to the relative high viscosity of the sealing means Premium Seal Repair which does not deposit from the inner side on the valve inserts.

Further it is positively to mention that during the filling of the sealing means Premium Seal Repair the valve insert has to be removed.

Contrary to that at the latex sealing means front right and rear right (Dunlop and Continental) significant deposits and residues of the tyre sealing means in dried and numbed form were detected under the microscope at the sealing surfaces of the valve (Fotos 68 und 69).

From the experience of examinations of different tyre defects in the past (mainly with motor cycles where tyre sealing means based on latex are preferably used) it is to mention that such residues of sealing means at the valve insert partly lead to slight leakages and creeping pressure drop with significant detraction of the road performance of the car and following accidents.
This leads to the conclusion that from the expert point of view the filling of latex products in case of a break down without removing the valve insert may lead to leakage problems at the valve insert.

The result is that the road stability of the car may be influenced negatively, that the tyre heats up and becomes defect.

8. Conclusion:

At the examination of Premium Seal Repair compared with two marketable latex products of tyre sealing means was ascertained that the product **Premium Seal Repair has the following advantages**:

a) Premium Seal Repair has a higher viscosity and causes therefore less soiling of rim, tyre and mounting devices.

b) Because the higher viscosity Premium Seal Repair can be removed quicker and easier from rims during cleaning. The cleaning of the tyres lasts equal time compared to latex products.

c) Premium Seal Repair caused during the tests no gluing and deposits at the valve inserts, it is not to expect that there are leakages of the valve insert in these test cases.

d) The repair test showed that the tyre treated with Premium Seal Repair was professionally to repair. The repaired tyre passed the high velocity test according to ECE-R 30 as well as the next higher velocity stage without any damages detectable.

Otherwise the applications of Premium Seal Repair and the marketable latex products are equal. This is valid for the sealing effectiveness of the tyre sealing means – there are no differences.

All together Premium Seal Repair shows technical advantages compared with latex products.

We have to make the hint that the repair of tyres which were treated with a breakdown aid according to the guideline of the minister of transportation is not allowed. There are clearing discussions with the BRV and the department of transportation necessary.

Best regards

The expert:

DEKRA Automobil GmbH

Niederlassung München

Ober- Ing. Dipl-Ing. (FH)

Abt. Sondergutachten

Franz Nowakowski

Elektronische Übermittlung – deshalb ohne Unterschrift

Information afterwards per e-mail zu Punkt 3 des vorliegenden Schriftstückes

Datum: 12.04.2005 12:22:38 Westeuropäische Normalzeit
Von: franz.nowakowski@dekra.com
An: PremiumVertrieb@aol.com
Internet-eMail: (Details)

The consequence of not sufficient cleaning of the rim especially at the bulge seat may be creeping air losses. There may be negative influences with enough pressure loss on the road stability, the rolling resistance with fuel consumption, the wear and the high velocity stability with the hazard of tread loosening and blowouts.

Annex: Inspection of hoseless valves (Fotos: DEKRA)

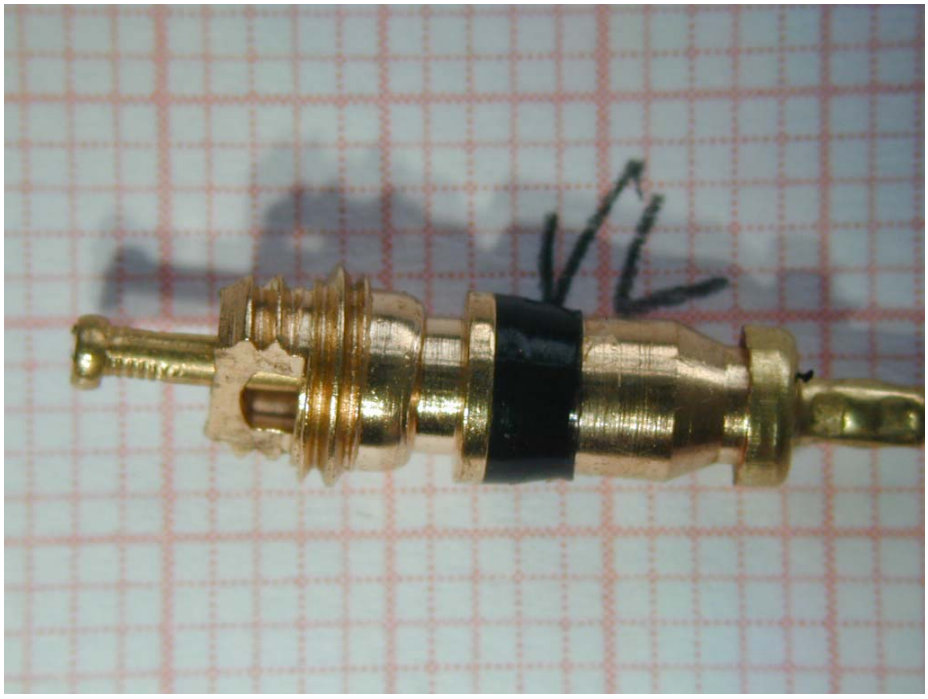

Bild 66: With PREMIUM-SEAL Repair there are no residues or deposits of sealing means detectable.

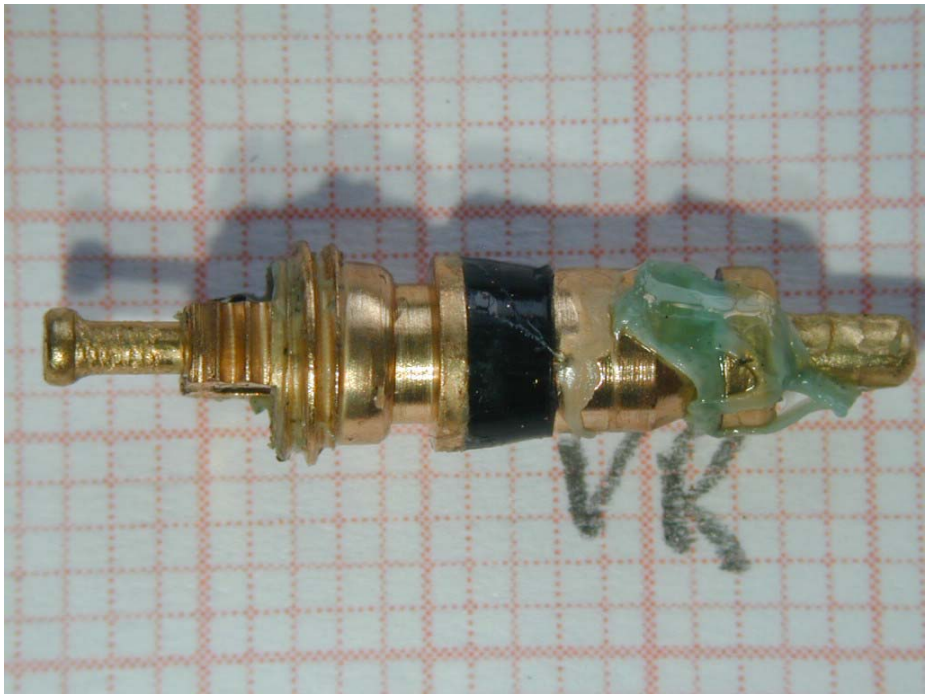

Bild 68: With latex products there are heavy deposits and residues of sealing means detectable.