Study shows methods considered competent only 10 years ago can result in an unsafe repair today.

A research project carried out by KTI GmbH & Co in Germany shows that **improperly repairing collision damage, especially in newer vehicles constructed with high tech materials, will lead to an unsafe vehicle in subsequent collisions.**

In a research paper presented in June at the 22nd International Technical Conference on the Enhanced Safety of Vehicles in Washington D.C., KTI detailed the results of its effort to objectively quantify the influence of non-professional repairs on the behavior of a car's body structure in a subsequent crash.

KTI, with the support of Volkswagen, subjected a 2005 VW Passat to two separate side impact crash tests; one on the undamaged car having never been repaired, and a second crash test after repairing the car using only "traditional" repair methods. According to KTI, the repair methods conformed to a typical repair standard carried out about 10 years ago, as if done today in a body shop with no information about the correct way to repair this particular car and without the correct tools or welding machines for the high-strength steels.

The body structure of late-model vehicles is typically made up of a number of modern steels, as seen in the diagram of this 2005 Passat.

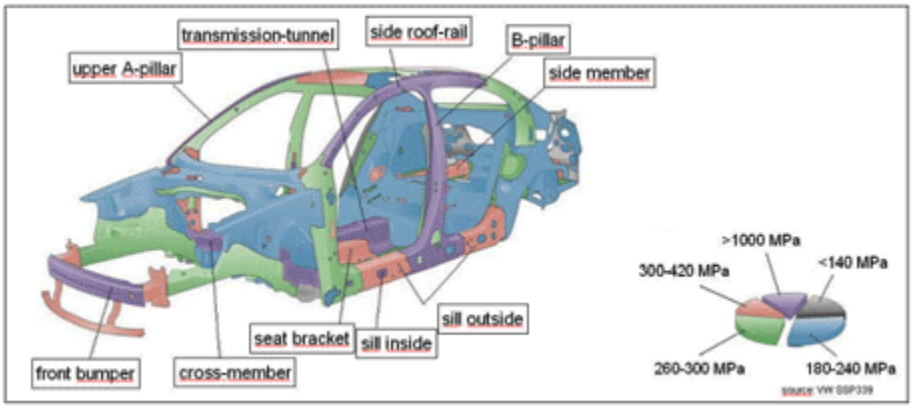

Figure 1. Distribution of steel grades in a VW Passat B6 (Source - VW)

With a side impact at 30 mph (the 50 km/h Euro NCAP standard) it was shown that a non-professional repair compromises the protection afforded by the original body structure. The specific results of the KTI test showed more than two inches of additional intrusion into the passenger compartment, increased damage to adjacent sections of the vehicle, and the failure of the side curtain airbag.

The Set Up

Following a first side impact crash of the original car using the Euro NCAP procedure, the repair of the damage caused by the first crash was carried out using traditional repair methods and older equipment that, today, would be considered a non-professional repair, no matter how competently those traditional repair methods may have been performed. Finally, differences in deformation behavior between the two crashes were analyzed to determine the implications for passenger safety.

The Passat was chosen for the tests because its structure represented a state of the art car body with several high-strength and ultra high-strength steels with one of the highest torsional stiffness values (about 30,000 Nm/°) in its segment. Also, KTI said it chose to test the side of the car because only small changes in intrusion distance can present a higher risk for the occupants than in frontal or rear-end impacts at similar speed.

The damaged car was repaired with an older spot welding machine with fixed pressure and 6.4 kA maximum current. For this repair, the OEM recommends an Inverter type welding machine with 10 kA maximum current and a variable pressure to join the high strength steel safely. The deformed inner sill, made from ultra high strength steel, was re-shaped and partially replaced on a bench then reinstalled using a MAG welding process.

The OEM procedure calls for complete replacement of the B-Pillar and other deformed components constructed with high strength steel. Repairing these components is not acceptable because the structure and strength of the material is severely degraded by welding and reforming.

The Results

After completing the repair, the car was again subjected to an identical side impact crash test.

Side structure after first crash | Side structure after second crash

"It was immediately evident that there was a substantial difference, with far more comprehensive deformation of the car body after the second impact. The B-pillar

had noticeably higher intrusion into the passenger compartment in comparison with the first crash, especially at the lower part at the connection with the sill," the report showed.

Measurement of the car body confirmed there was 60 mm (2.3 inches) more intrusion after the second test, compared to the first crash.

Other differences noted by KTI included damage to areas that were unaffected by the initial crash due to the change in load paths caused by the substandard repair. The roof and the transmission tunnel both displayed severe deformation not seen in the first crash, and the top right corner of the windshield was damaged in the second crash.

Perhaps most notable is that in the second crash, the front and rear passenger side airbags and front passenger belt pre-tensioner were correctly deployed, but the passenger side curtain airbag failed to operate.