

## **Development of Crash-related Structural Components made of Fibre Reinforced Plastics for the Motor-vehicle Industry**

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### **Summary**

An effective means of reducing the energy demand of motor vehicles is lightweight design, since all components of the overall road resistance except for the aerodynamic resistance are approximately proportional to the vehicle weight. Because of the excellent specific stiffness and strength of high performance fibre reinforced plastics and the necessity of saving the available crude-oil resources, these materials are expected to gain more and more importance in the motor-vehicle industry.

In the scope of both an integrated research and industrial projects, prototypes of various vehicle components made of fibre reinforced plastics have already been developed at the Institut für Kraftfahrwesen Aachen. The objective of a current research project is the realisation of a bumper beam with textile reinforcement for a passenger-car body.

The development of the bumper beam is accompanied by an extensive programme of material tests. The test results form the basis of the material selection on the one hand and the validation of simulation models on the other hand. Apart from standardised tensile and compressive tests, that programme also comprises tear-out tests on boreholes in the laminates as well as dynamic three-point bending tests on profiled samples. The bumper structure is designed, so that it fits into the space which is available in a reference car. The design is then optimised using numerical algorithms based on the finite element method. After the manufacturing of prototypes, the results of mechanical tests will make it possible to assess the performance of the combination of material and component design.