

## **Lighter Passenger Car Chassis**

- **Two ZF studies show the potential of lightweight construction and functional integration in chassis technology**
- **MCT axle bridges the gap between twist beam rear axle and multilink rear suspension**
- **Axle design with wheel-controlling transversal leaf spring: innovative and economically attractive rear axle**

**New paths in chassis technology: ZF has two concepts for passenger car rear axles and shows the potential which arises by using lightweight construction and functional integration. In the crosshairs: improving the economy and going easy on resources – without trade-offs in driving dynamics, safety, or comfort.**

Weight reduction is also possible in the chassis – and this is where it particularly makes sense. If the chassis weight is reduced, lower engine power suffices to attain the same performance as a car with a conventional chassis. Moreover, fewer unsprung masses considerably improve the vehicle's dynamic and comfort characteristics. Costs also play a part: With the complexity and number of structural components in passenger car chassis, there has also been an increase in material and assembly costs in the past few years. With its two concept studies for passenger car rear axles, ZF has embarked on a new path in chassis technology - less weight and less complexity. Without having to make a compromise in driving dynamics or safety compared to conventional twist beam rear axles.

### **Same performance with less effort**

One of the main targets when developing the axle study with wheel-controlling transversal leaf spring was to improve the economy. It has been possible to reduce the number of components by using new materials and functional integration – without any trade-off in terms of driving characteristics. One substantial feature of the new ZF axle design is a transversal leaf spring made of fiber-glass reinforced plastic. In addition to

suspension-related and stabilizing functions, this individual component also takes over wheel guidance – and thus also essential tasks for the vehicle's tracking stability and safety. By using this central component, the previously needed stabilizers with bearings and two tie rods, transverse control arms, and conventional helical springs each, are no longer required. As a result, the assembly and integration effort is reduced – without any compromise regarding driving behavior or specific design possibilities by the vehicle manufacturer.

### **Low-cost alternative to the multilink rear suspension**

The MCT ("Multi Compliance Twist Beam") axle by ZF pursues another development approach. The study aimed at developing an innovative and economical rear axle design on the basis of a twist-beam rear axle, which nearly renders the performance of a multilink rear suspension - but without considerable additional cost. In order to achieve the kinematic and elastokinematic properties of a multilink rear suspension, it is usually necessary to separate the functions and thus have a targeted design for the chassis-specific properties. What's different about the MCT axle by ZF? A new, innovative suspension of the wheel carrier generates a virtual pivot which moves the wheel in toe-in, both for transverse and longitudinal forces. This principle of a multi-compliance twist beam axle presents driving properties which were previously only possible with multilink rear suspensions: lateral force understeering, toe-in under brake force and an optimized bump toe-in with reciprocal spring compression. The suspended wheel carriers also have a positive effect on vibration decoupling. The elastokinematic axle parameters offer automotive developers and manufacturers additional leeway for design. The MCT axle can thus bridge the gap between the classical twist-beam rear axle and multilink rear suspension.



Captions:

- 1.) Low-cost and innovative: The ZF rear axle study with wheel-controlling transversal leaf spring shows the potential of functional integration and lightweight construction in a passenger car chassis.
- 2.) Elastokinematic features of a multilink rear suspension, but without their complexity and weight: The MCT axle by ZF ("Multi Compliance Twist Beam Axle") offers considerably more driving dynamics than a conventional twist beam axle.

Photos: ZF

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ZF is a leading worldwide automotive supplier for Driveline and Chassis Technology with approximately 60,000 employees at 125 production locations in 26 countries. In order to continue to be successful with innovative products, ZF annually invests five percent of its sales (2008: EUR 697 million of EUR 12.5 billion) in Research and Development.

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