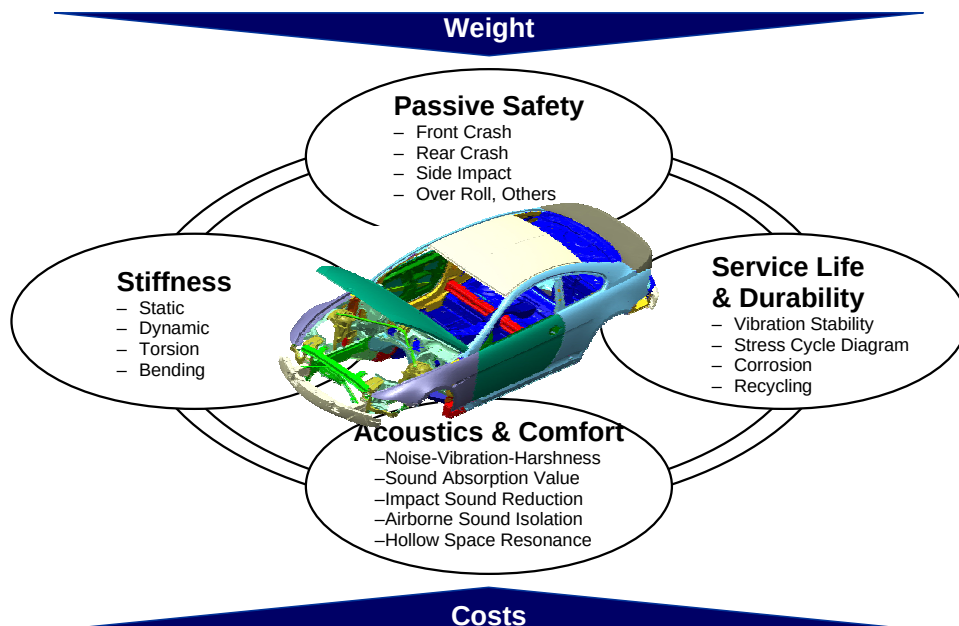
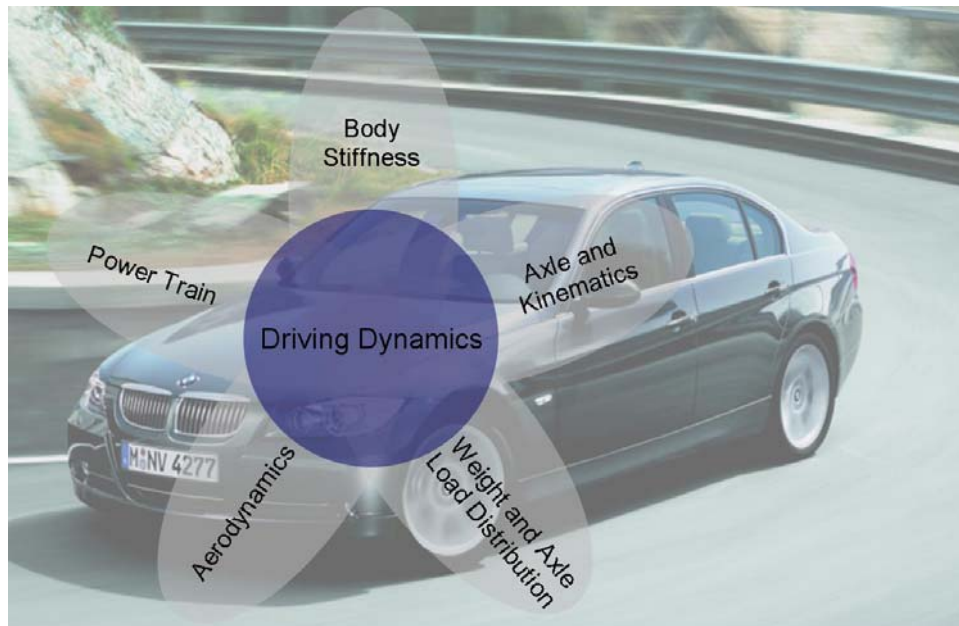


Functional Properties of High Strength Steel in the Body in White

Markus Pfestorf
Jacobus van Rensburg
BMW AG



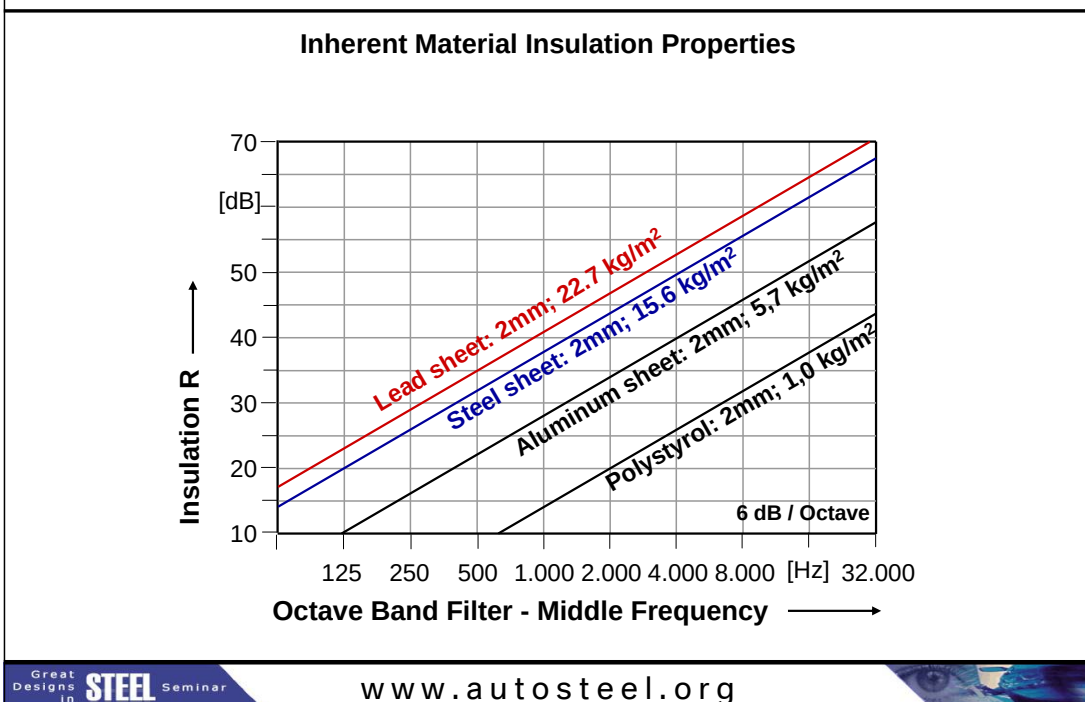
1. Introduction
2. Acoustics
3. Durability
4. Stiffness
5. Passive Safety
6. Corrosion
7. Cost Considerations
8. Conclusion

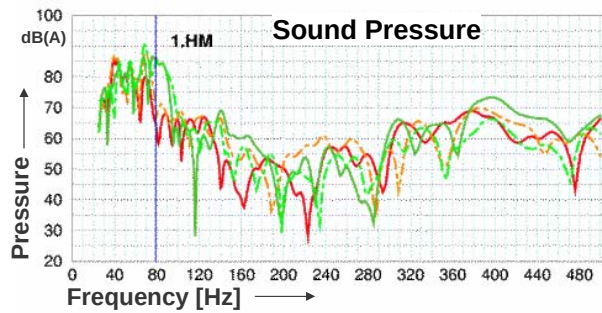


		Yield Strength $R_{p0,2}$ [MPa]
STEEL	LSS	Low Strength Steel
	HSS	High Strength Steel
	AHSS	Advanced High Strength Steel
	UHSS	Ultra High Strength Steel
ALUMINUM	5xxx	AlMg-Aluminum Alloys (AlMg3,5Mn, AlMg4,5Mn0,4)
	6xxx	AlSi-Aluminum Alloys (z.B. AlSi1,2Mg0,4, AlSi0,6Mg0,5)
		140 to < 180
		180 to < 300
		≥ 300
		≥ 600

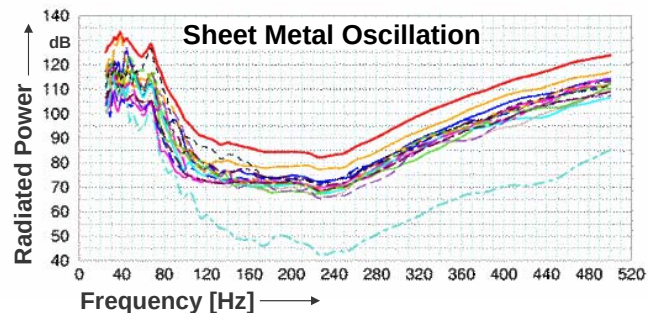
Great Designs in **STEEL** Seminar

www.autosteel.org



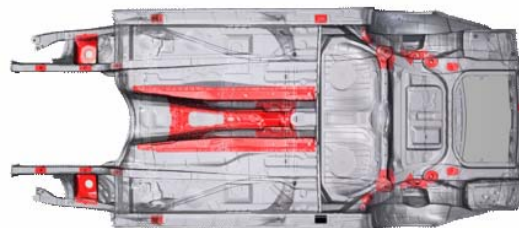


NOTE:
Various value sets
represent measurement
points at various locations
of the vehicle



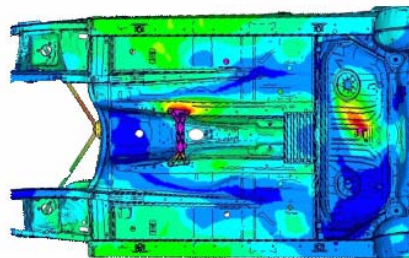
Load Transmission

- Very high local stiffness for a minimum excitation of the panels

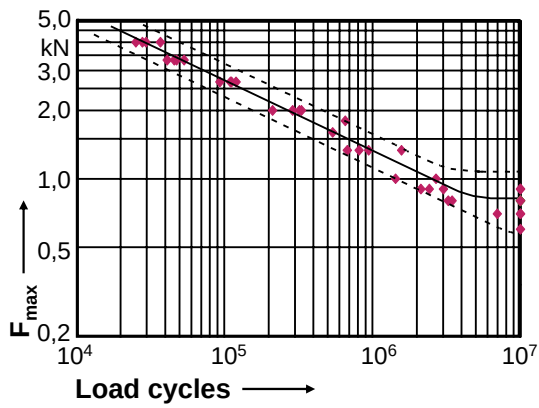


Pulsation of the Floor Panel

- Excitation Gearbox Mounting
- Homogeneous vibration behavior and a minimum sound radiation of the floor panel



Basic Material data

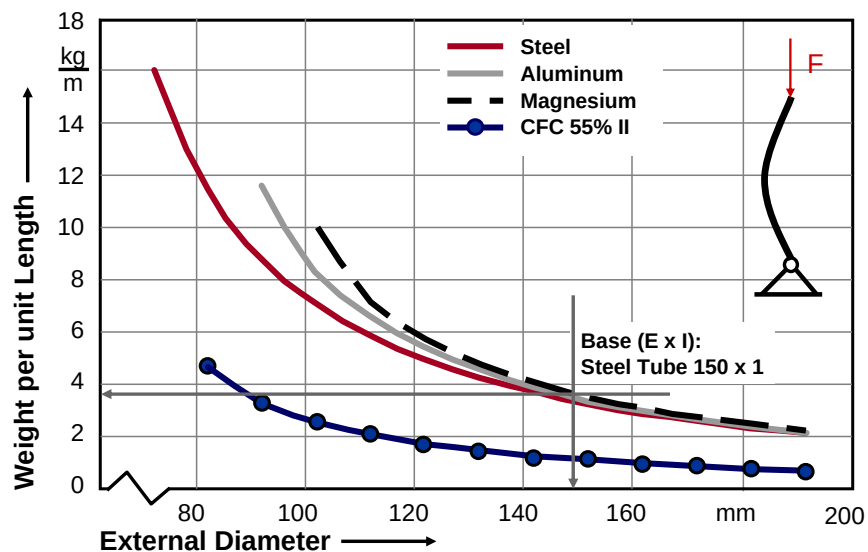


Component Tests

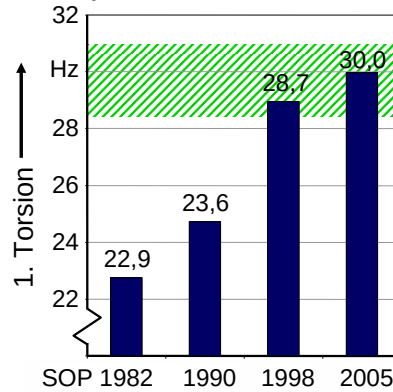


Body in White incl. Wind Screen, Doors, Hoods, Bonnet, axle carrier, crash beam, and other parts which are relevant for durability behavior

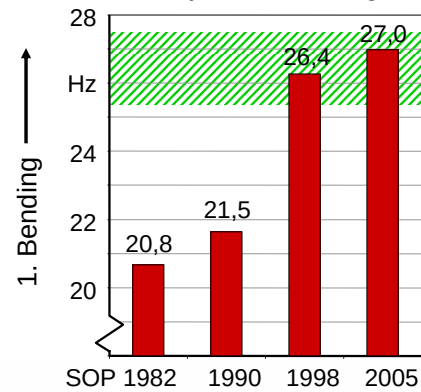
Tubular Sections



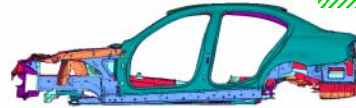
1st. natural frequency of the dynamic Torsion



1st. natural frequency of the dynamic bending



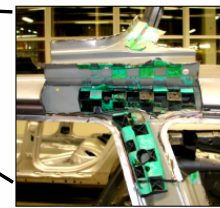
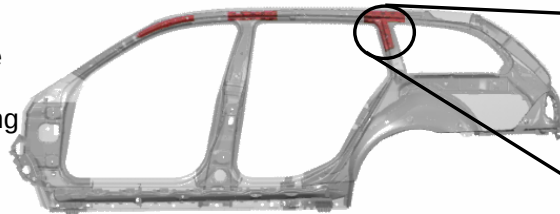
ideal frequency



inflated scale

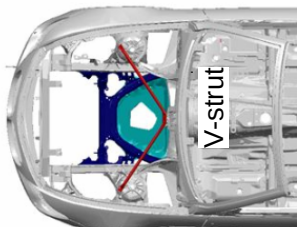


Structure foam in the side frame
BMW 5 series Touring

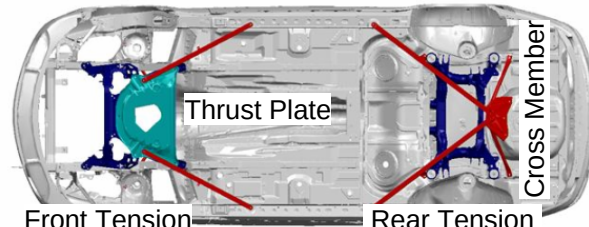


TOP VIEW

BOTTOM VIEW



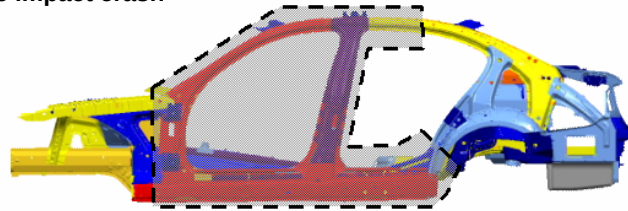
BMW 6 series Convertible



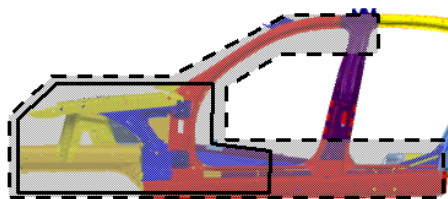
Front Tension Strut

Rear Tension Strut

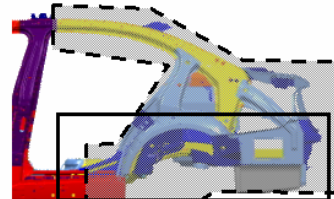
Side impact crash - - -



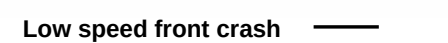
High speed front crash - - -



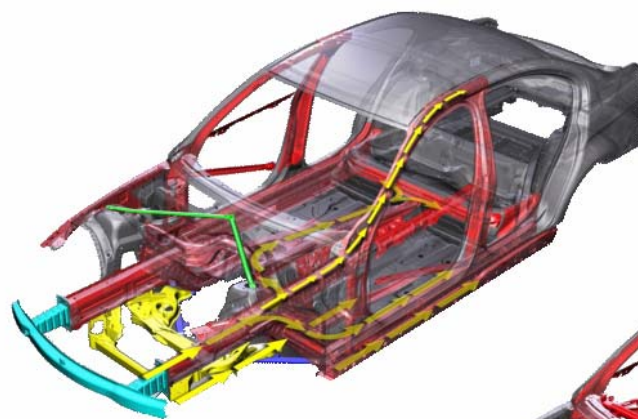
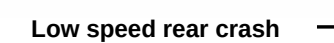
High speed rear crash - - -



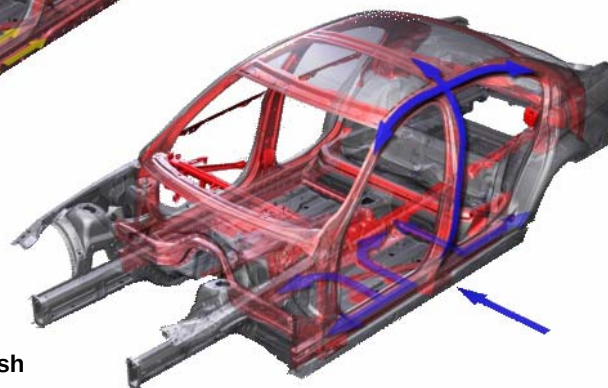
Low speed front crash ———



Low speed rear crash ———



Front Crash



Side Crash

Rear Crash: BMW 6 Series

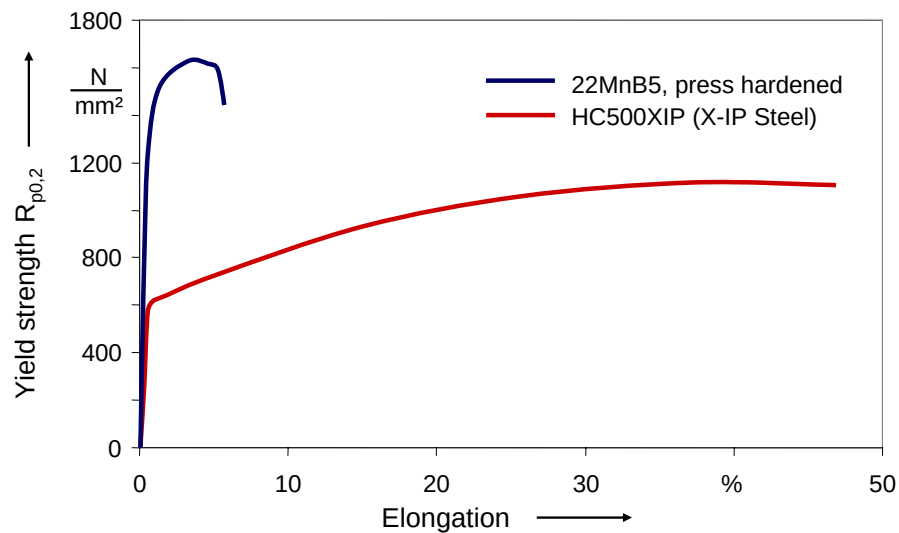


Data for rear crash

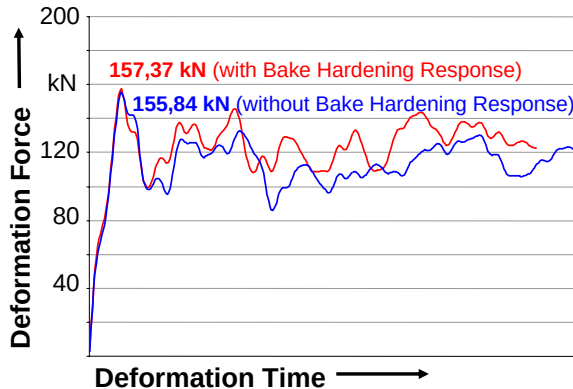
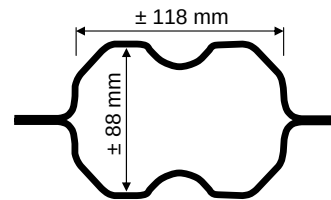
- Car weight: 1978 kg
- Barrier weight: 1365 kg
- Barrier speed: 81,7 km/h

Results:

- No impact of fuel tank
- No impact in passenger cabin
- No brittle fracture of trunk lid



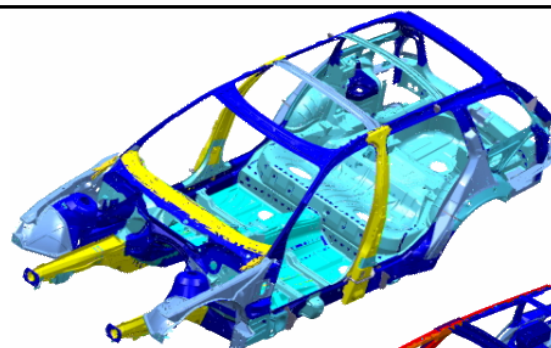
	Mech. Properties (as delivered)	Mech. Properties (180°C, 60 min.)
Yield Strength $R_{p0.2}$	692 MPa	796 MPa
Tensile Strength R_m	901 MPa	923 MPa
Elong. after Fracture A_{90}	11,4	10,8
Thickness	0,99	0,99



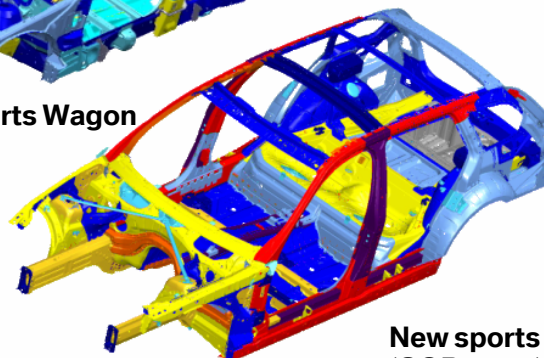
Tested profile



Specimen after crash test



Previous Sports Wagon
(SOP 1999)



New sports wagon
(SOP 2005)

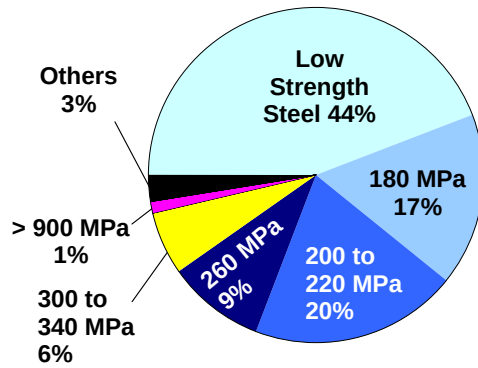
Steel

- other Steel Grades
- DC 03/04
- DX 54
- DX 56
- HC160YD, HC180BD, HC180YD
- HC220BD, HC220YD
- HC260BD, HC260YD, HC260LAD
- HC300BD, HC300LAD, HC300XD
- HC340LAD, HC340XD
- HC380LAD
- HC400TD
- HC420LAD
- HD680C
- MS-W1200, Docol1000

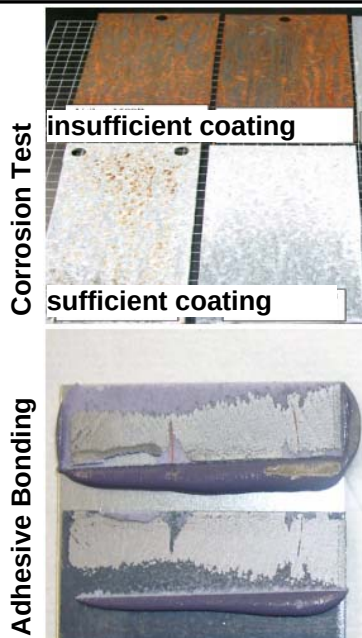
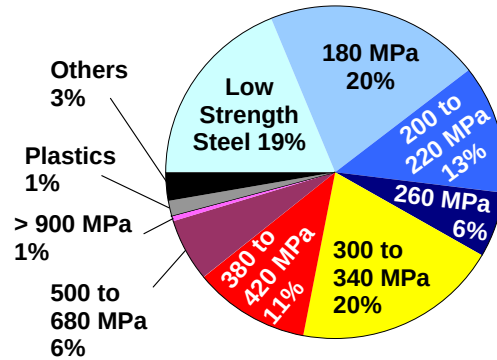
Others

- plastic
- other metallic materials

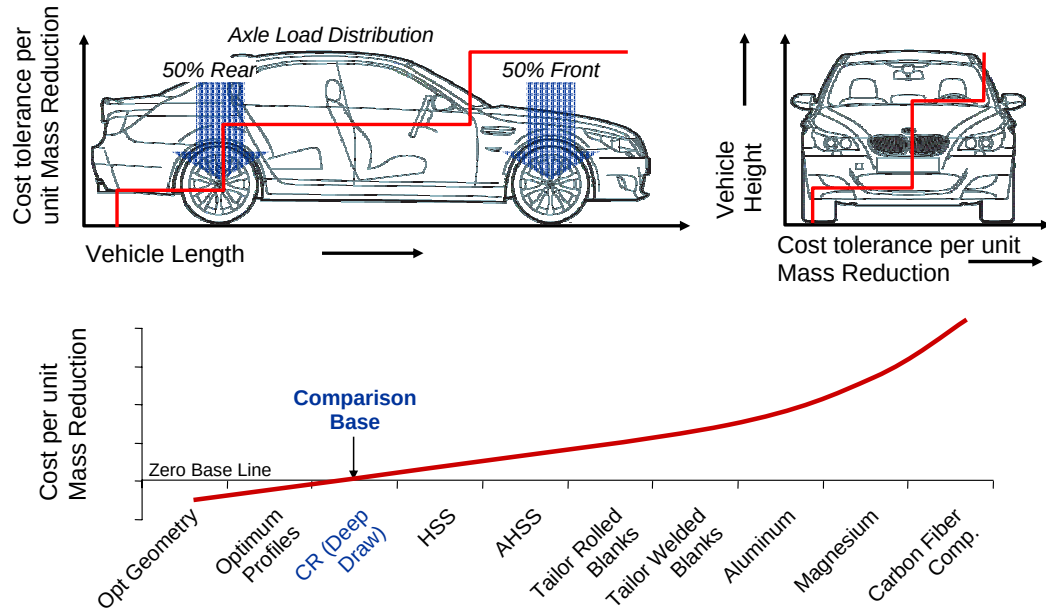
Previous sports wagon
(1999 to 2005)



New sports wagon
(SOP 2005 to present)



real test on the vehicle



There will be a further Demand on

- Ultra High Strength Steel Grades
- Sheets with a thin Gage
- Corrosion Surface Treatment



- Low Strength Steel + High Strength Steel Grades
- Advanced High Strength Steel Grade
- Ultra High Strength Steel Grade
- Others

Thank you for your interest