

UNIVERSITÄT PADERBORN
Die Universität der Informationsgesellschaft

BENTELER

dSPACE

HEGGMANN

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PDE Automotive

Wendt Maschinbau
Engineering Labortechnik

BENTELER-SGL
AUTOMOTIVE COMPOSITES



upb racing
PX 210

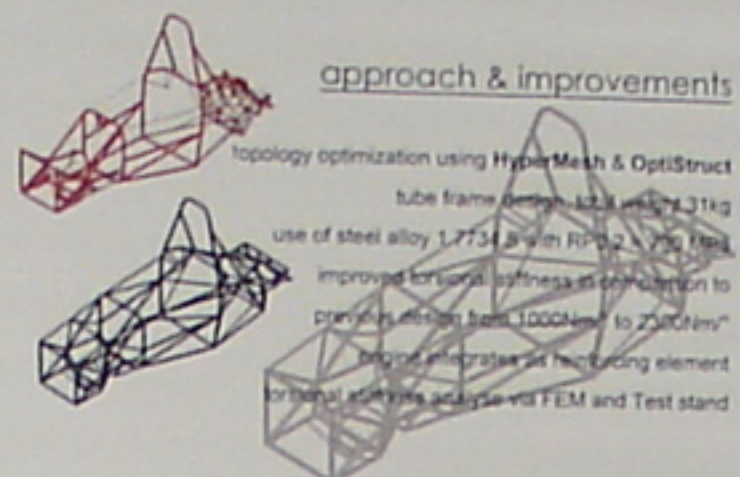
www.upbracing.de

design REPORT

PX210

engineering design

- 2.1: completion of 3D package models with Solid Works
- 2.2: engineering design with Solid Works
- 2.3: FE-analysis with Abaqus



approach & improvements

- 2.1: topology optimization using HyperMesh & OptiStruct
- 2.2: tube frame design with 211g
- 2.3: use of steel alloy 1.7734 with 10% Ni
- 2.4: improved torsion stiffness by 10%
- 2.5: improved torsion stiffness by 10%
- 2.6: improved torsion stiffness by 10%
- 2.7: improved torsion stiffness by 10%
- 2.8: improved torsion stiffness by 10%
- 2.9: improved torsion stiffness by 10%
- 2.10: improved torsion stiffness by 10%

approach & improvements

- 2.1: light-weight enclosure made of carbon/fibre reinforced plastic
- 2.2: flow simulation of the chassis using CosmOS
- 2.3: sandwich construction combines weight reduction with high rigidity

approach & improvements

- 2.1: trapezoidal shaped crash form
- 2.2: 2.0mm wall thickness
- 2.3: crash simulation with LaDyna
- 2.4: weight reduction of 2.5 kg

approach & improvements

- 2.1: topology optimization using HyperMesh & OptiStruct
- 2.2: aluminum frame design, used alloy 6061-T6 (3.4365)
- 2.3: total weight of 60 kg for the front and 64.9 kg for rear rocker
- 2.4: improved stiffness compared to previous design

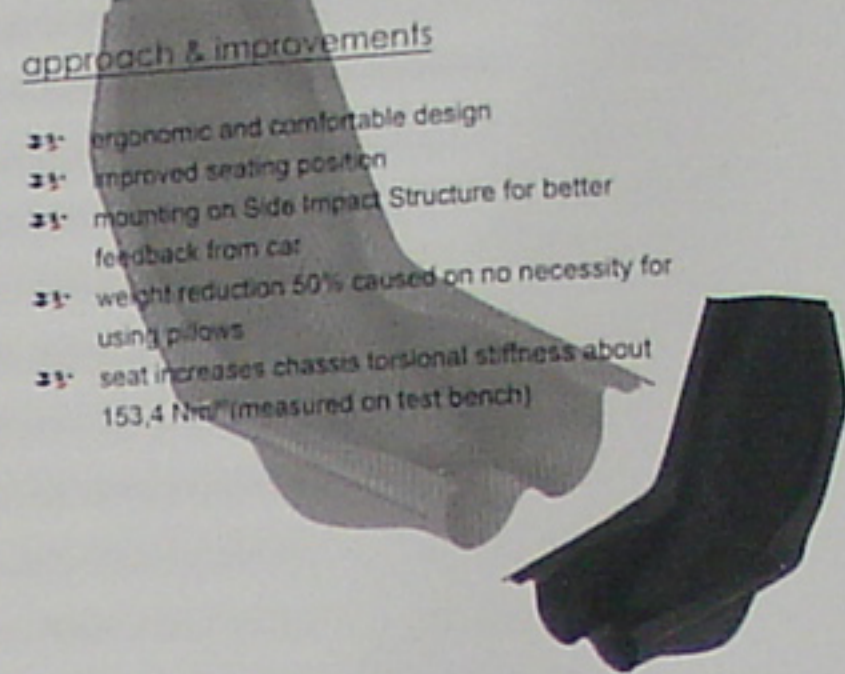
FRAME . BODY & ROCKER

design REPORT

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engineering design

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approach & improvements

- 2.1: ergonomic and comfortable design
- 2.2: improved seating position
- 2.3: mounting on Side Impact Structure for better feedback from car
- 2.4: weight reduction 50% caused on no necessity for using pillows
- 2.5: seat increases chassis torsional stiffness about 153.4 Nm (measured on test bench)

approach & improvements

- 2.1: construction with two CFRP base plates enabled us to improve the stiffness of the steering wheel
- 2.2: 3D-scans of handmade grip-models allowed us to design more comfortable grips to improve the drivers skills
- 2.3: better mechanical for clutch and shift for better usability

approach & improvements

- 2.1: reduce the weight of the pedals by half (approx. 130g - 150g)
- 2.2: pedals are laser cut
- 2.3: improved adjustability by laser cut rail
- 2.4: ergonomic heel support

ERGONOMICS

design REPORT

PX210

hardware

- 2.1: AMOLED-Display
- 2.2: contactless vr-sensor for clutch/pedal
- 2.3: two pedals for up and downshifting
- 2.4: buttons for launch-control and radio

software

- 2.1: communicates with the control unit for shifting and to clutch
- 2.2: displays all important engine sensor values and warnings
- 2.3: gives the driver the possibility to calibrate the clutch sensor
- 2.4: user-interface to adjust environmental variables, e.g. LED brightness

approach & improvements

- 2.1: full electronic clutch by use of a stepper motor
- 2.2: controlled over CAN-Bus with steering wheel
- 2.3: automatic clutch function for down shifting
- 2.4: fast acting through 48V high power controller

48V switching supply

- 2.1: high efficiency, up to 95%
- 2.2: wide input voltage range
- 2.3: up to 400W output power
- 2.4: low ripple noise through 4-phase regulator

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