WIPAG

A MEMBER OF THE ALBIS GROUP

AGENDA

- Introduction WIPAG – a member of the ALBIS group
- WIC Carbon – Light Weight Design with secondary carbon fibre compounds
- Case studies
- Summary

WIPAG - INTRODUCTION

- > 25 years of experience in recycling of plastics
- 2 production sides (Neuburg a.D. / Gardelegen), 7 compounding lines, > 55.000 MT/a capacity
- Patented, economically viable „Closed-Loop“ recycling-processes
- Closed Loop has been successfully practised sinces several years by WIPAG together with well known OEMs / Tiers in the automotive industry
- Innovative Carbon Fibre Recycle Technology
- ISO 9001, ISO 14001, ISO 50001 certified
- Certified Waste Management Company according to § 52 Closed substance cycle an Waste Management Act

➡ **WIPAG since years has been successfully practicing Recycling.**

WIPAG – CLOSED / OPEN LOOP RECYCLING TECHNOLOGY

Post Industrial
- Bumper
- Rocker Panel
- I-Panel, Dashboard
- Spoiler
- …

Post Consumer:
- Bumper
- Wheel-Arch-Liner
- I-Panel, Dashboard
- Front-End
- …

Patented Developments
- Composite Separation
- De-Coating
- Carbon Fibre-Recycling

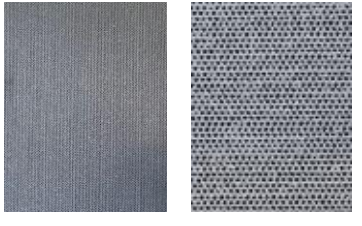
Shredder Technology

Separation Processes
- Density
- Optics / Color
- Elektro-Statics

Regranulation / Compounding
- Fine Melt-Filtration (80µm,120µm)

„Closed Loop“

„Open Loop“



WIPAG – CARBON FIBRE COMPOUNDS
INNOVATIVE LIGHT WEIGHT DESIGN

Finished material

Posttreatment

Drying

Waterring-pelletizing

Extrusion

Addition of polymer

Weighing

Feeding

Preliminary chopping

Delivery of fibres

CASE STUDIES

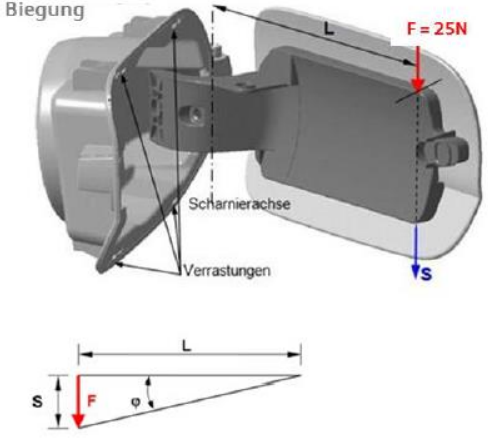
LIGHT-WEIGHT DESIGN – WIC PP 30
REPLACEMENT OF PA6 GF50

- AUDI Filler cap – hinge arm development with WIC PP 30
- Motivation & Requirements:
  - Replacement of series material PA6 GF50
  - Strong mechnaical properties (modulus, stiffness, elongation at break, etc)
  - Size of the filler caps are growing (AdBlue, e-mobility)
  - Unpainted surfaces
  - Low CLTE and water uptake to keep gap tolerances low
  - Cost effective process for high volume series production

	PA6 GF 50 Serie (cond.)	WIC PP 30 s-CF
tensile modulus MPa	11.500	12.500
Density g/cm³	1,58	1,05
tear strength MPa	165	90
elongation at break %	6	3
shrinkage %	0,1	0,05

LIGHT-WEIGHT DESIGN – WIC PP 30
REPLACEMENT OF PA6 GF50

Simulation result (load case bending). Diagram in mm.



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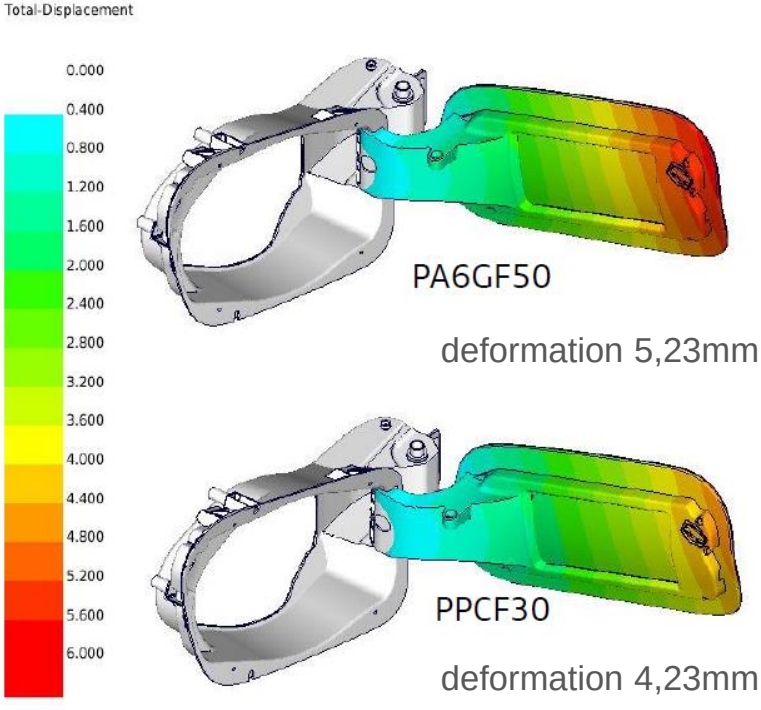

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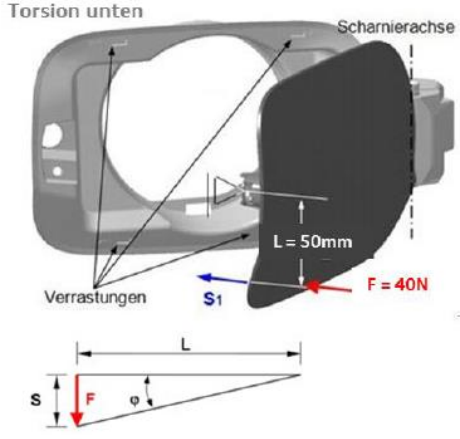
LIGHT-WEIGHT DESIGN – WIC PP 30
REPLACEMENT OF PA6 GF50

Simulation result (load case torsion). Diagram in mm.



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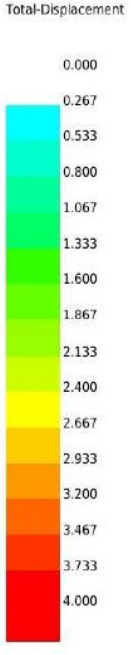
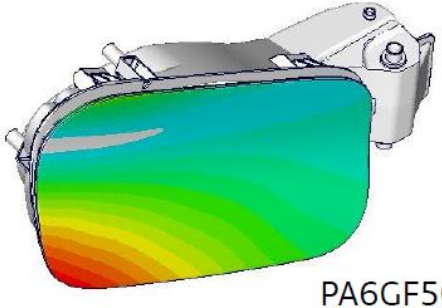
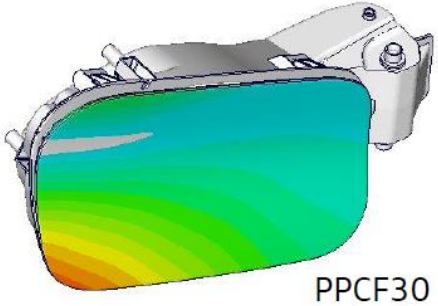




PA6GF50 deformation 3,87mm



PPCF30 deformation 3,27mm

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LIGHT-WEIGHT DESIGN – WIC PP 30
REPLACEMENT OF PA6 GF50

- AUDI
- Filler cap – hinge arm
- WIC PP 30
  (PP+rCF30, carbon fibre 30%)
- Slight design changes vs PA6 GF50 version
- Advantages
  - Weight reduction (Density 1,05 g/cm³)
  - Higher stiffness
  - Shorter cycle time
  - Improved dimension stability at no water uptake and low CLTE

➡ **Weight reduction 35% vs. PA6-GF50, 7% cost reduction.**

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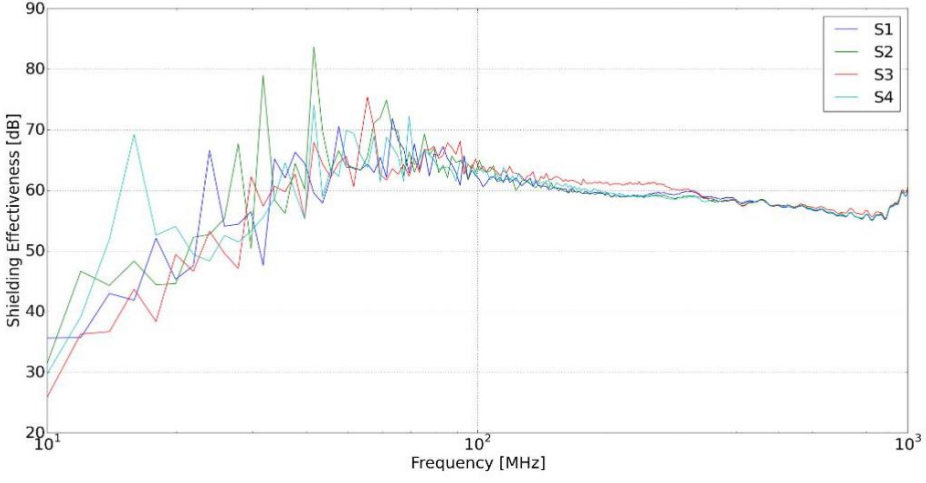
LIGHT-WEIGHT DESIGN - WIC PP 15/30 REPLACEMENT OF PA6 GF30/50

- Application for Industry
- Bormann
- Mobile workplace including printer and laptop for industrial applications (e.g. vehicle test technician, service expert)
- WIC PP15 BKD with 15 % secondary carbon fibre
- WIC PP30 BKD with 30 % secondary carbon fibre
- Advantages
  - Weight reduction of 35% compared to version with Polyamide GF30/50
  - High stiffness and low warpage
  - High dimensional stability
  - ESD properties

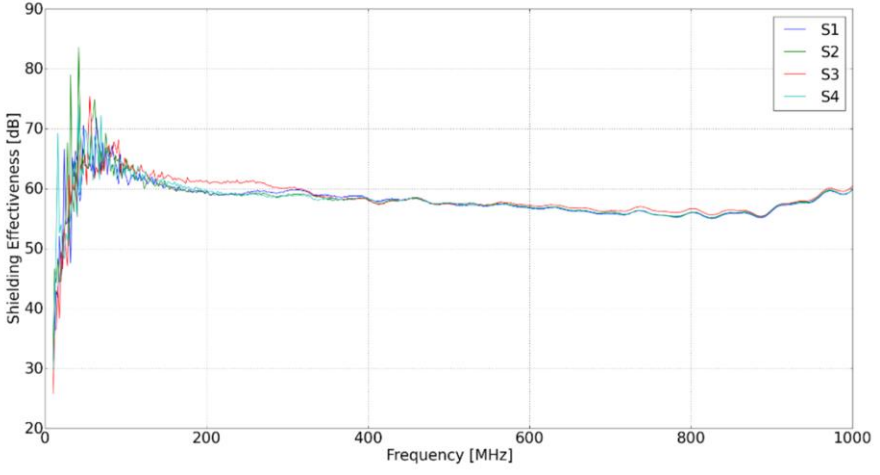
WIPAG R-CARBON FIBRE FOR E&E
ESD PROPERTIES & STIFFNESS

- Festool
- Pre-Separation of industrial dust by cyclone technology
- Electrostatic discharge therefore inevitably
- WIC PA66 30 BK with 30% secondary carbon fiber is highly conductive
- Advantages
  - Cost save versus virgin carbon fiber compound with same ESD properties
  - Light-weight design with high mechanical properties

EMI SHIELDING OF WIC PP EMI R-CF 15
FAR FIELD



Measurement 1: TEM-t - 10 MHz – 1000 MHz (logarithmic scale)



Measurement 2: TEM-t - 10 MHz – 1000 MHz (linear scale)

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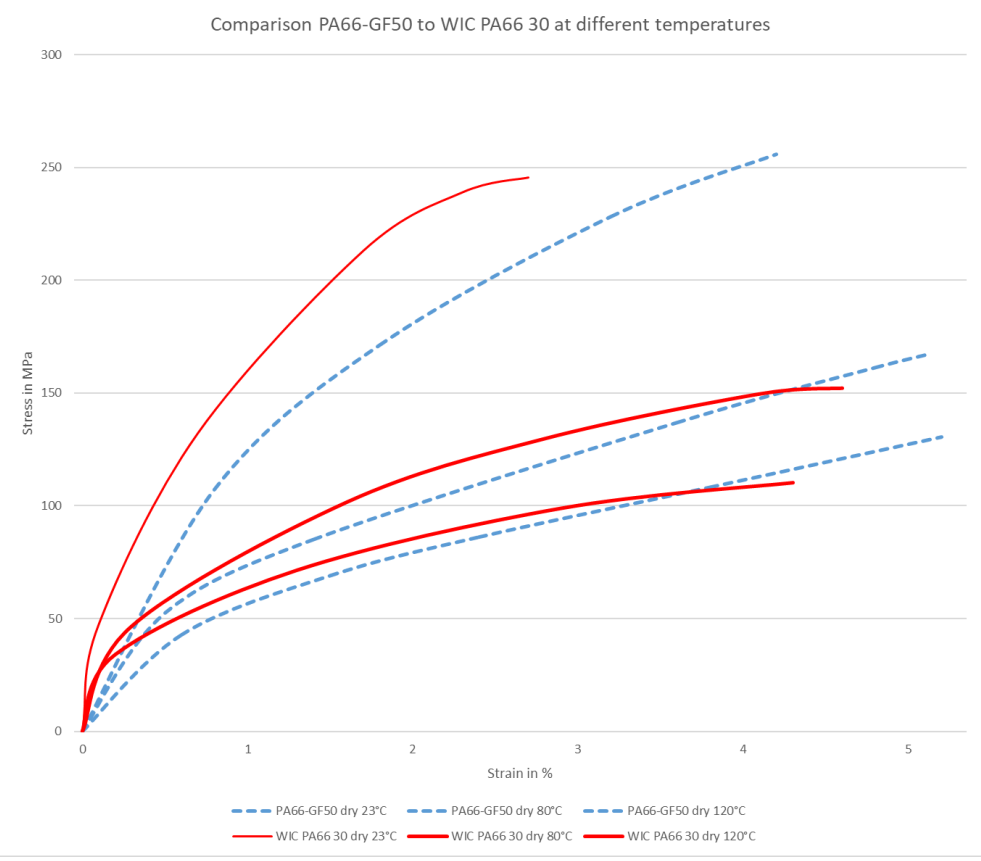
WIC PA 66 30 VS PA 66 GF50 STRESS/STRAIN CURVE



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SUMMARY

- WIPAG secondary carbon fiber reinforced compounds are a cost effective solution for Light Weight Design and replacement of high filled glass fiber materials
- Alternative material for conductive and shielding applications in E&E market
- Sustainable solution for reduction of CO_2 footprint

DISCLAIMER

Note:

Any information given on the chemical and physical characteristics of our products, including technical advice on applications whether verbally, in writing or by testing the product, is given to the best of our knowledge. However, this information is given without obligation and does not exempt the buyer from carrying out own investigations and tests in order to ascertain the product's specific suitability for the purpose intended. The buyer is solely responsible for the application, utilization and processing of the products, and must observe the laws and government regulations and the consequential rights of any third party. At all times our Conditions of Sale apply. Our product lists include dangerous goods. The correct marking of such goods is described in the respective data sheets.

BACK UP SLIDES

CARBON COMPOUNDS
PATENT SITUATION

Confirmation and Undertaking

of << WIPAG Gesellschaft>>,

hereinafter referred to as **SUPPLIER**

vis-à-vis

<< KUNDE >>,

hereinafter referred to as **MANUFACTURER.**

I.

The **SUPPLIER** supplies carbon-fibre-reinforced thermoplastic material to the **MANUFACTURER**.

II.

Bayerische Motoren Werke Aktiengesellschaft, Munich, Germany, is the **PROPRIETOR** of the following family of patents (hereinafter referred to as **PATENT RIGHTS)**

country	Official no.	title
Germany	10 2012 212 610.4	Verfahren zur Herstellung von Leichtbauelementen aus kohlenstofffaserverstärktem, thermoplastischem Kunststoff
EP	EP2687349	Verfahren zur Herstellung von Leichtbauelementen aus kohlenstofffaserverstärktem, thermoplastischem Kunststoff

The **PATENT RIGHTS** are directed to a method for producing lightweight components from carbon-fibre-reinforced thermoplastic material by injection moulding.

III.

The **MANUFACTURER** intends to produce lightweight components by injection moulding from the carbon-fibre-reinforced thermoplastic material obtained from the **SUPPLIER.** Therefore, the **MANUFACTURER** has an interest that such use of the material is authorized by the **PROPRIETOR** in view of the **PATENT RIGHTS**.

IV.

Based on the foregoing, the **SUPPLIER** hereby confirms vis-à-vis the **MANUFACTURER** that the use of carbon-fibre-reinforced thermoplastic material obtained from the **SUPPLIER** for producing lightweight components by injection moulding, is authorized by the **PROPRIETOR** in view of any of the **PATENT RIGHTS**.

V.

Furthermore, the **SUPPLIER** undertakes to indemnify the **MANUFACTURER** in view of claims of the **PROPRIETOR** based on the **PATENT RIGHTS** in conjunction with the use of carbon-fibre-reinforced thermoplastic material supplied to the **MANUFACTURER** by the **SUPPLIER**.

Place, date

SUPPLIER

(name, signatory power)

Ende des Dokuments

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