

WIPAG - Ecology and economics thanks to the
use of the recycled carbon fibers

IN TOUCH WITH PLASTICS



A MEMBER OF THE ALBIS GROUP

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Agenda

IN TOUCH WITH PLASTICS

- WIPAG Intro
- Closed Loop Recycling
- CFK Lightweight Design
- Case Studies



The WIPAG - Group

IN TOUCH WITH PLASTICS



WIPAG Süd GmbH & Co. KG
Nördliche Grünauer Straße 31
D-86633 Neuburg/Donau
☎ +49 (0) 8431 4336-0



WIPAG Nord GmbH & Co. KG
Buschstückenstraße 20
D-39638 Gardelegen
☎ +49 (0) 3907 77592-10

Founded: 1991 / 2001

Employees: > 75

Capacity: > 55.000 t/y

Joint Ventures:

PPR WIPAG – Dover, UK

ACI WIPAG – Flint, USA

Kapazität: > 27.000 t/y

Certifications

IN TOUCH WITH PLASTICS

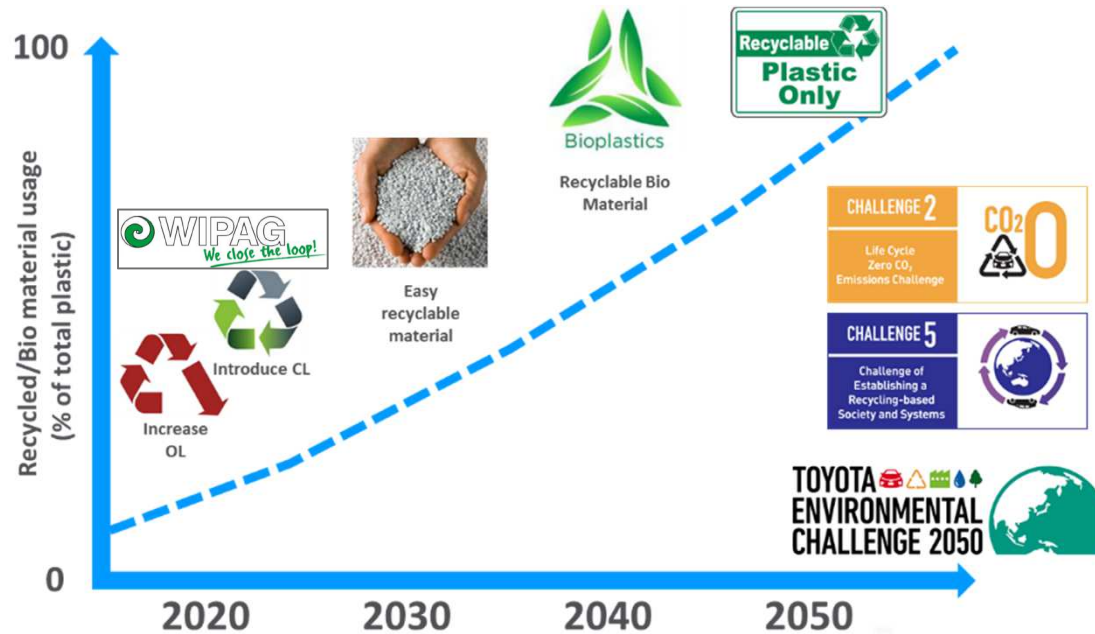


- Entsorgungsfachbetrieb gemäß § 52 Kreislaufwirtschafts-/Abfallgesetz
- DIN EN ISO 9001:2018
- DIN EN ISO 14001:2018
- DIN EN ISO 50001:2018

A hand is shown holding a glowing, spherical digital network. The sphere is composed of numerous white nodes connected by thin white lines, with some nodes highlighted in green and blue. The background is a soft, light blue gradient.

CLOSING THE LOOP

WIPAG – Closed Loop Recycling Trends in the Automotive Industry



Quelle:
**PLASTICS
RECYCLING
TECHNOLOGY 2017**

20 - 21 June 2017, Maritim Hotel, Cologne, Germany

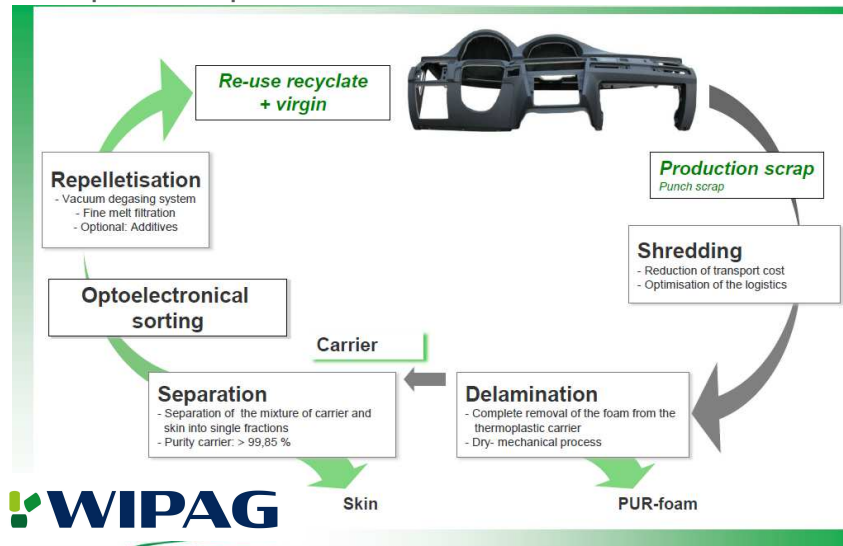
10.40 **Plastic recycling strategy towards 2050**
Mr. Lodewijk Coevert, Senior Engineer, Organic Materials,
Material Engineering division, R&D,
TOYOTA MOTOR EUROPE, Belgium and
Mr. Peter Wiedemann, General Manager,
WIPAG DEUTSCHLAND GmbH, Germany

➔ Increase materials recycle usage >2.5 times next 5 years - TOYOTA

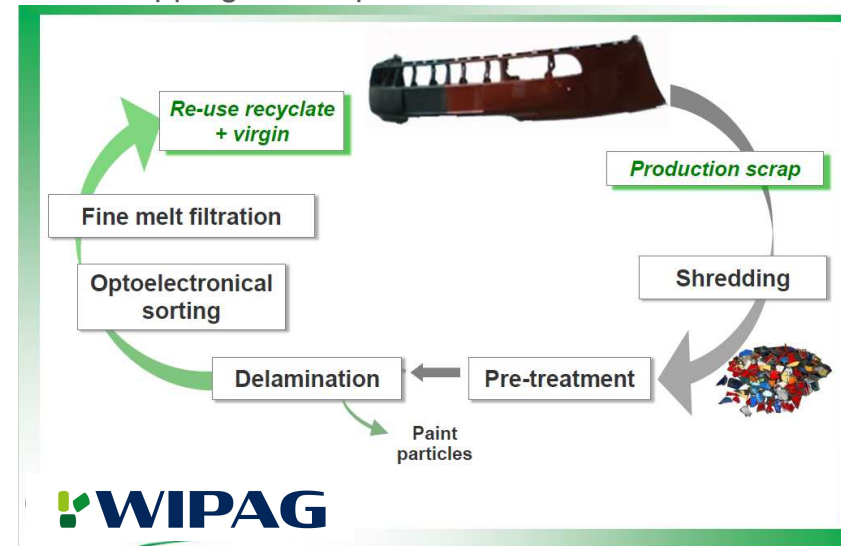
WIPAG – Closed Loop Recycling Recycling Processes

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Composite separation of dashboards



Paint stripping of bumpers



➔ The WIPAG Closed-Loop technologies are the most sustainable way of recycling and closed-loop economy.

WIPAG – Closed Loop Recycling WIPALEN PP-GF

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PP-Compounds

WIPALEN GF20

Availability: in total 500 t/a

WIPALEN GF30

Availability: in total 500 t/a

Delivery time: 6 weeks, EU-wide

Properties: see table

Material	Norm	Unit	WIPALEN GF20 (PP GF20)	WIPALEN GF30 (PP GF30)
Colour			black	black
Ash	ISO 3451-1	[%]	20 +/- 3	30 +/- 3
Tensile Modulus	ISO 527	[MPa]	> 2800	> 3500
Tensile Strength	ISO 527	[MPa]	> 30	> 35
Tensile Strength at Break	ISO 527	[MPa]	> 30	> 35
Tensile Strain at Break	ISO 527	[%]	> 2,0	> 1,4
Charpy Impact Strength (23°C) 1eU	ISO 179	[kJ/m ²]	> 26	> 25
Charpy Notched Impact (23°C) 1eA	ISO 179	[kJ/m ²]	> 6	> 5
MVR (230°C/2.16kg)	ISO 1133	[cm ³ /10min]	25 +/- 10	20 +/- 10

A hand is shown holding a glowing, spherical digital globe. The globe is composed of a complex network of white lines connecting various nodes, some of which are highlighted in green and blue. The background is a soft, light blue gradient.

CARBON FIBER COMPOUNDS LIGHTWEIGHT DESIGN WITH CFK

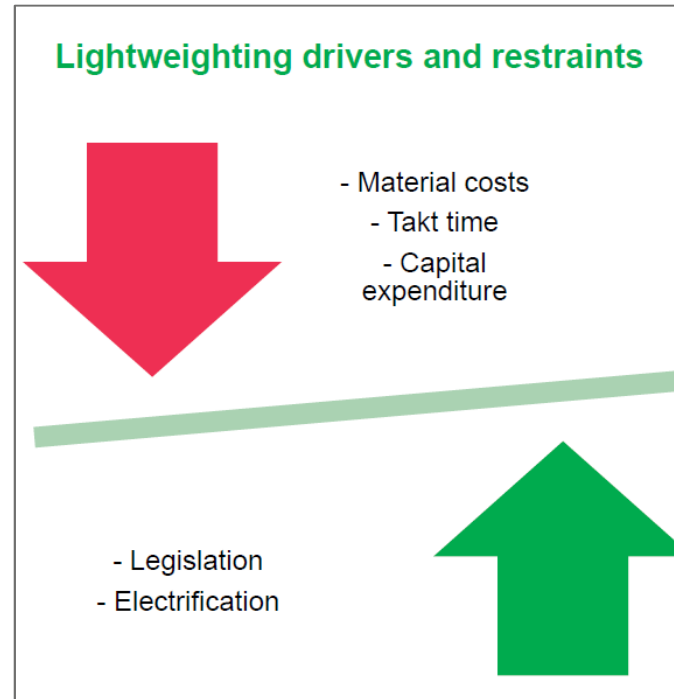
WIPAG – Carbon Fiber Compounds Lightweight Design with CFK

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- Carbon fibers push up prices
 - Prime Carbon Fiber: >15 €/kg
- Glass fiber: factor >10 cheaper, only 40% higher density than CF



- Legislation calls for lower CO₂ emissions
- Weight reduction essential for e-mobility
 - Range increase
 - Compensation of battery weight in the car

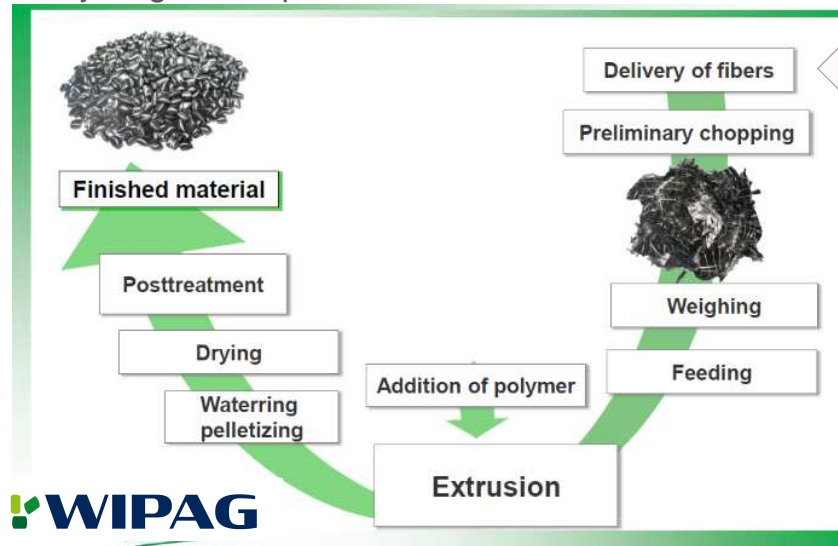


➔ **Carbon fibers are necessary for future lightweight concepts, but prices for prime carbon fibers are too high!!**

WIPAG – Carbon Fiber Compounds Lightweight Design with CFK

IN TOUCH WITH PLASTICS

Recycling of scrap carbon fiber mats



CFK lamination process (e.g. RTM)



➔ WIPAG CARBON Recycling allows for new lightweight potentials

WIPAG – Carbon Fiber Compounds

WIC PP (PP rCF) – Substitute for PP GF

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- Example: Substitution of PP GF50

- Density: 1.34 g/cm³
- Tensile modulus: 9600 MPa

→ WIC PP20 (PP rCF20)

- Density: 1.01 g/cm³
- Tensile modulus: 9800 MPa

✓ **Weight reduction: 25%**



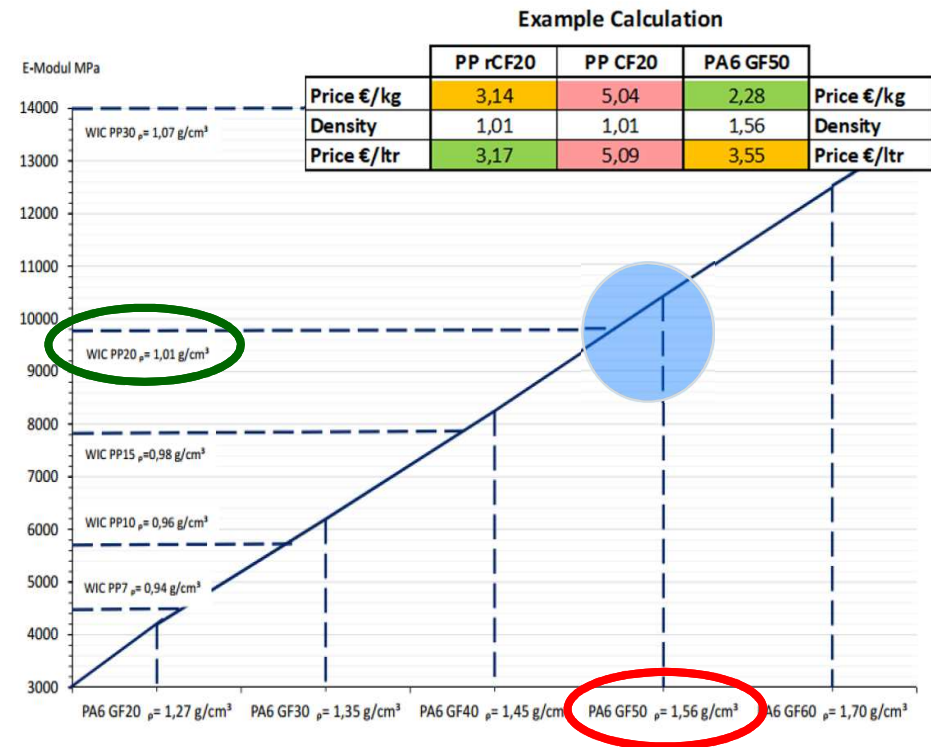
WIPAG – Carbon Fiber Compounds

WIC PP (PP rCF) – PA6 GF Replacement

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- PA6 GF50
 - Density: 1.56 g/cm³
 - Tensile modulus (cond.): 10200 MPa
- WIC PP20 (PP rCF20)
 - Density: 1.01 g/cm³
 - Tensile modulus: 9000 MPa

- ✓ **Weight reduction: ~35%**
- ✓ **Matching properties & dimensions**
- ✓ **Price reduction per part: ~10% based on Volume/ Liter- Price !**



WIPAG – Carbon Fiber Compounds

Properties of Standard Products

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Material	Norm	Unit	WIC	WIC	WIC	WIC	WIC	WIC	WIC	WIC
			PA6 10	PA6 20	PA6 30	PA6 40	PP 10	PP 20	PP 30	PP 40
Density	ISO 1183	[g/cm ³]	1,17	1,23	1,27	1,33	0,95	1,01	1,05	1,11
Charpy Impact Strength (23°C) 1eU	ISO 179	[kJ/m ²]	40	55	58	60	25	45	48	45
Charpy Notched Impact (23°C) 1eA	ISO 179	[kJ/m ²]	4	7	9	9	5	8	9	9
Tensile Modulus	ISO 527/2	[MPa]	9000	13.500	24.000	27.000	5.700	9.000	13.000	15.500
Tensile Strength	ISO 527/2	[MPa]	125	160	190	210	58	80	86	90
Tensile Strain at Break	ISO 527/2	[%]	3,6	1,4	1,3	1,2	1,8	1,6	1,3	1,0
Shrinkage	intern	[%]	L:0,09 B:1,20	L:0,00 B:1,20	L:0,01 B:1,18	L:-0,02 B:1,12	L:0,18 B:1,44	L:0,08 B:1,15	L:0,05 B:0,91	L:0,00 B:0,80

➔ **WIPAG CARBON: Highest level at lowest density**

CASE STUDIES



Sustainability, A Real Trend Lightweight Design – CFRP

IN TOUCH WITH PLASTICS

- AUDI / ITW
- Gas door hinge
- WIC PP 30
(PP+rCF30, 30% carbon fiber)
- Benefits
 - Lightweight (density 1.05 g/cm³)
 - High stiffness
 - Improved dimensional tolerance
 - Consistently high material quality
 - Sustainability (100% recycling, polymer + carbon fiber)
 - Cost reduction via volume/part-price



➔ **Weight reduction 35% vs. PA6-GF50 + cost reduction.**

Sustainability, A Real Trend Lightweight Design – CFRP

IN TOUCH WITH PLASTICS

- BMW / B+W
- Engine Cover
- ALTECH PA6 ECO 7010/100
(PA6 +rCF10, 10% carbon fiber)
- Benefits
 - Lightweight (density 1.17 g/cm³)
 - Temperature resistance
 - High impact strength
 - High surface quality
 - Consistently high material quality
 - Sustainability (>80% recycling, polymer + carbon fiber)
 - Cost reduction via volume/part-price

➔ **Weight reduction 15% vs. PA6-MR/GF + cost reduction.**



Sustainability, A Real Trend Lightweight Design – CFRP

IN TOUCH WITH PLASTICS

- BMW
- Boot Shelf Support (5-Series Touring)
- WIC PP 10
(PP+rCF10, 10% carbon fiber)
- Benefits
 - Substitution of PA6 GF
 - Lightweight (density 0.95 g/cm³)
 - High stiffness
 - Sustainable material solution using recycled secondary carbon fibers
 - Improved dimensional tolerance



➔ Sustainable lightweight design in series production.

Sustainability, A Real Trend Lightweight Design – CFRP

IN TOUCH WITH PLASTICS

- NORTH
- Kiteboard-Foil
- WIC PA66 30, MI 110
(PA66+rCF30, 30% carbon fiber)
- Benefits
 - Light weight construction (density 1.27 g/cm³)
 - High gap-size-precision (low shrinkage because of CF)
 - Decrease of process costs
(injection molding instead of lamination)
 - Stable material quality
 - Sustainability (>30% Recycling CF)
 - Cost savings @ part costs



Light weight construction, plus cost savings.

Sustainability, A Real Trend Lightweight Design – CFRP

IN TOUCH WITH PLASTICS

- APEX, US
- XP Big Mountain - Ski Boot System
- WIC PA66 30, MI 110
(PA66+rCF30, 30% carbon fiber)
- Benefits **Open-Chassis™**
 - Adjustable Flex-Arm with four forward lean positions
 - Tunable A-Flex Suspension™ provides three flex settings
 - Chassis built **with all-new NanoLite Carbon material** making XP even lighter
 - Patent-pending 3-Point Instep Strap (3PS)
 - Medial and lateral cuff alignment



XP Big Mountain

949.00 USD

➔ **Light weight construction, plus cost savings.**

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