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Biocomposites Conference Cologne

7th Conference on Wood and Natural Fibre Composites

6–7 December 2017, Maternushaus, Germany

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Table of Contents

Seventh Biocomposites Conference Cologne	3
Programme 1 st Day 6 Dec. 2017	4
Programme 2 nd Day 7 Dec. 2017	6
Biocomposite Award 2017	8
Coperion: Biocomposite Award 2017 Sponsor.	10
Overview of the Exhibition.	12
Sponsors and Partners of the Conference	13
Article: Natural fibre-reinforced plastics: establishment and growth in niche markets	14
Bronze Sponsors.	17
Advertisements	19

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Programme Committee

A prestigious committee has been set up for the programme, consisting of representatives of the following companies and institutes:

- **Dr. Elmar Witten** | AVK – Industrievereinigung Verstärkte Kunststoffe e.V.
- **Katharina Brozyna** | BASF Color Solutions Germany GmbH
- **Peter von Hoffmann** | Coperion GmbH
- **Thorsten Weber** | Der Grüne Punkt – Duales System Deutschland GmbH
- **Dr. Hans Korte** | Dr. Hans Korte Innovationsberatung Holz und Fasern
- **Jens Fischer** | DRW-Verlag Weinbrenner GmbH & Co.KG, Holz-Zentralblatt
- **Pierre Bono** | Fibre Recherche Développement (FR)
- **Dr. Arne Schirp** | Fraunhofer-Institut für Holzforschung – Wilhelm-Klauditz-Institut WKI
- **Prof. Dr.-Ing. Jörg Müssig** | Hochschule Bremen – City University of Applied Sciences
- **Dr. Andreas Haider** | Kompetenzzentrum Holz GmbH (AT)
- **Michael Carus** | nova-Institut GmbH
- **Dr. Asta Partanen** | nova-Institut GmbH
- **Stephan Hofherr** | Verband der Deutschen Holzwerkstoffindustrie e.V. (VHI)
- **Jörg Golombek** | Werzalit GmbH + Co. KG

Seventh Biocomposites Conference Cologne

We welcome you to the world's largest conference on biocomposites!

The biocomposite markets continue to grow, both in established markets like construction and automotive as well as in the new market of consumer goods with new players bringing opportunities to innovative applications. There are many reasons to fill or reinforce plastics with wood or natural fibres of all kinds. Optical and haptic reasons play a role when it comes to differentiating products from standard plastic products. Especially in household goods, consumer goods and toys attributes like, optics, haptics and a green image are important considerations. Weight savings, shorter cycle times, scratch resistance and a lower CO₂ footprint play a crucial role in technical applications and in the automotive industry. And, in combination with biodegradable plastics, products are also manufactured in agriculture, horticulture and also for special applications such as filter balls and coffee capsules.

Today, in addition to experienced component manufacturers who have been offering a wide variety of biocomposites for years, there are new suppliers on the market who want to use innovative technologies and materials to produce and market even better granulates.

The "Biocomposites Conference Cologne (BCC)" is the world's largest conference and exhibition on the topic. This conference offers you the unique opportunity to gain a comprehensive overview of the world of biocomposites in Cologne.

Living proof for the above mentioned development are our nominees for "The Biocomposites Award 2017". Here, the nova-Institute would like to acknowledge Coperion GmbH (DE) for sponsoring this renowned innovation award. Many thanks also go to our conference sponsors: "Der Grüne Punkt – Duales System Deutschland GmbH (DE)" as silver sponsor and Fibres Recherche Développement (FR), FKUR GmbH (DE), Linotech GmbH & Co. KG (DE) & ParaPack GmbH (DE), RENOLIT GOR S.p.A. (IT), simcon kunststofftechnische Software GmbH (DE) as well as VTT Technical Research Centre of Finland LTD (FI) as bronze sponsors.

More than 200 participants from all over the world and 25 exhibitors confirm our position as the lead conference in this field.

One of the highlights will be awarding the title "Biocomposite of the Year 2017". This innovation award highlights new materials and products that entered the market in 2017 or are just about to be launched. You as audience will have the opportunity to elect three winners from six nominees at the first afternoon of the conference. The winners will be awarded on the same evening during the gala dinner.

Besides the award, the conference programme demonstrates the wide spectrum of innovative applications and material choices available for biocomposites: In automotive applications, in wood-plastic composites, in injection moulding, 3D printing and design as well as in structural applications. Bio-based thermoset resins, new polymers, wood and natural fibres for biocomposites are well represented in our programme.

We wish you a conference full of encouragement, new contacts and ideas for new business opportunities. Enjoy our conference!



Michael Carus, managing director of nova-Institute
Dr. Asta Partanen, project leader of the conference

and the nova conference team

P.S.: "Every year, the city centre of Cologne is touched by the magic of the festivities in the run-up to Christmas. Christmas music, arts and crafts, toys, Christmas decorations and the scent of the Christmas bakeries create a wonderful atmosphere."



Michael Carus
nova-Institut GmbH
Managing Director



Dr. Asta Partanen
nova-Institut GmbH
Project Leader of the Conference

Conference Programme

1st Day, 6 December 2017, 9:30 a.m. – 6 p.m.

CHAIRWOMAN



nova-Institut GmbH 
Dr. Asta Partanen

CHAIRMAN



nova-Institut GmbH 
Michael Carus

CONFERENCE OPENING



9:50 nova-Institut GmbH 
Michael Carus
Conference Opening

WOOD-PLASTIC COMPOSITES




10:00 German Wood-Based Panel Industry (VHI) 
Anemon Strohmeier
NATURinFORM GmbH 
Horst Walther



Overview of the German Wood-Plastic Composite Industry



10:20 WPC Wood-Plastic Composite Council of China 
Dr. Wayne Song
WPC Development and Actual Trends in China

BIOCOMPOSITES IN AUTOMOTIVE



10:50 Ford Forschungszentrum Aachen GmbH 
Maira Magnani
Biocomposites: a Milestone Towards Sustainable Mobility within Ford Motor Company



11:20 Volkswagen AG 
Benedikt Lahl
Fiber Reinforced Composites for Structural Applications Made from Bio-based and Recycled Materials



11:50 Renolit GOR S.p.A. 
Adriano Odino
FCA EMEA 
Marco Tuninetti
The Application of RENOLIT NATGOR at New Alfa Romeo Stelvio



12:20 LUNCH BREAK



13:50 Bcomp Ltd 
Sophie de Rijk
powerRibs in Automotive, the Benefits of Using Flax Grid Reinforcements in Automotive Large Series Interiors and Race Car Body Parts



14:10 Performance BioFilaments Inc. 
Gurminder Minhas
Automotive Biocomposites Based on Nano-Fibrillated Cellulose Technology



14:30 VTT Technical Research Centre of Finland Ltd. 
Heidi Peltola
Light-Weight Solutions with Wood Based Biocomposites

INJECTION MOULDING: GRANULATES AND APPLICATIONS



14:50 nova-Institut GmbH 
Dr. Asta Partanen

Successful Biocomposites in Toys, Furniture and Consumer Goods

CHAIRMAN



Kompetenzzentrum Holz GmbH 
Dr. Andreas Haider

15:20 COFFEE BREAK



15:50 Dr. Hans Korte Innovationsberatung Holz & Fasern 
Dr. Hans Korte

X-Plorator – High Throughput Technology for Rapid Compound Development



16:10 Elastopoli Oy 
Markku Nikkilä

Simcon kunststofftechnische Software GmbH 

Dr. Paul F. Filz
Injection Moulding and Simulation of Consumer Products with Aqvacomp Composites



16:30 Kompetenzzentrum Holz GmbH 
Dr. Claudia Pretschuh

Regenerated Cellulose Fibres TENCEL® FCP as Filler in PP for Improved Foam Injection Moulding

INNOVATION AWARD SESSION

16:50 Prize-giving DNFI Innovation Award 2017 by Michael Carus, nova-Institut GmbH 




16:50 RWTH Aachen University 
Marie-Isabel Popzyk


Fraunhofer-Institute for Structural Durability & System Reliability LBF 
Dr. Roland Klein


Reduction of the Moisture Absorption of Natural Fibres and Production of No-Twist Yarns for Use in Structural Components




CHAIRMEN



nova-Institut GmbH 
Dr. Asta Partanen



nova-Institut GmbH 
Michael Carus

INNOVATION AWARD "BIOCOMPOSITE OF THE YEAR 2017"

17:00 Introduction by Michael Carus, nova-Institut GmbH 




17:10 BASF SE & Sonae Arauco Deutschland AG 
Dr. Michael Kalbe
3D Moldable MDF



17:20 GreenBoats 
Friedrich J. Deimann
Greenbente24



17:30 G.S. Stemeseder GmbH 
Bernhard Mösl
GS Stratos® Passive – Sandwich Window Scantling System



17:40 OWI GmbH 
Bernd Köhler
Injection Moulded Biocomposite School Seat Shell



17:50 Raimund Beck Nageltechnik GmbH 
Dr. Hans Korte
LignoLoc® – Collated Wooden Nails



18:00 TU/e University of Technology Eindhoven in Collaboration 
Prof. Dr. Patrick Teuffel
Fully Biobased Pedestrian Bridge


18:15 Champagne Reception by VTT and Cold Local Beer on Tap
20:00 Gala Dinner and Coperion sponsored Award Ceremony
22:00 Social Gathering

Conference Programme

2nd Day, 7 December 2017, 9 a.m. – 6 p.m.

CHAIRMAN



Innovationsberatung
Holz & Fasern 
Dr. Hans Korte

CHAIRMAN



Hochschule Bremen – City
University of Applied
Sciences 
Prof. Dr.-Ing. Jörg Müssig

BIOCOMPOSITES IN 3D PRINTING AND DESIGN



9:00 Kompetenzzentrum
Holz GmbH 
Dr. Andreas Haider
*Use of Biocomposites in
3D-Fused Layer Modelling*



9:20 FKUR Kunststoff GmbH 
Carmen Michels
*Be Creative with Bioplastics and
Natural Fibres! – Compounds for
3D Printing*



9:40 SINTEF Building and
Infrastructure 
Nathalie Labonnote
*Biocomposites for 3D Printing in
Construction*



10:00 University of Stuttgart 
Jun.-Prof. Dr.-Ing. Hanaa Dahy
*Biocomposites for Architecture
Between Design and Fabrication
– Current and Future Visions*

10:20 COFFEE BREAK

STRUCTURAL APPLICATIONS




10:50 FEMTO-ST Institute 
Dr. Ing. Vincent Placet
*Characterisation and Prediction
of the Long-Term Behaviour
of Plant Fibre Composites for
Semi-Structural Applications*



11:10 Eindhoven University
of Technology 
Prof. Dr. Patrick Teuffel
*Structural Use of Hemp and Flax
Fibres with Bio-based Resins
– Possibilities for Design and
Structural Use*



11:30 Fibres Recherche
Développement (FRD) 
Dr. Natalie Benoit
*From Plant to Agromaterial:
Innovative Axes to a Better
Design of Bio-based Fibres
Used in Thermoplastic
Composites*

11:50 LUNCH BREAK

BIO-BASED THERMOSET RESINS AND NEW POLYMERS



13:20 nova-Institut GmbH 
Michael Carus

*Overview of Bio-Based
Polymers for Biocomposites*



**13:30 TransFurans
Chemicals bvba** 
Dr. Ir. Hans Hoydonckx

*New Applications of Polyfurfuryl
Alcohol Thermosets in
Biocomposites*



**13:50 Advanced
Biochemicals Co., Ltd.** 
Pawin Boonyaporn

*Epicero® - A Bio-Based
Epichlorohydrin to Further
Improve the Environmental
Footprint of Composites
Through Epoxy Resins*



**14:10 Covestro
Deutschland AG** 
Richard Meisenheimer

*New Bio-based Polyisocyanate
– Opens the Way to New Green
Lightweight Applications*



14:30 Shellac Consultant 
Manfred Penning

*SHELLAC – A Unique Natural
Thermoplastic Resin for
Biocomposites*

14:50 COFFEE BREAK

WOOD AND NATURAL FIBRES FOR BIOCOMPOSITES



**15:20 Hochschule Bremen
– City University of Applied
Sciences** 
Prof. Dr.-Ing. Jörg Müssig

*New NFC Product Development
Starts with the Selection of an
Appropriate Fibre*



**15:40 Fraunhofer-Institute
for Wood Research (WKI)** 
Dr. Arne Schirp

*Improvement of the Fire
Retardancy of Wood-Plastic
Composites (WPC) by Wood
Pre-Treatment*



**16:00 VTT Technical Research
Centre of Finland Ltd.** 
Kirsi Immonen

*Biocomposites from Side
Streams of Paper and
Board Industry – Fibre Clay
Composites*



**16:20 University Hamburg
Center of Wood Science and
Technology** 
Oliver Mertens

*In-Situ Refiner Compounding
Approach for TMP-Fibre
Thermoplastic Composites*



16:40 HempFlax BV 
Mark Reinders

*Why You Should Use European
Hemp Fibres for Biocomposites*



17:00 Bucknell University 
**Prof. Dr. Katsuyuki
Wakabayashi**

*Flax Fiber-Polyamide 6
Composites via Solid-State
Shear Pulverization: Expanding
the Portfolio of Natural Fiber-
Reinforced Thermoplastics*



17:20 Faurecia 
Dr. Hassane Boudhani

*New Lightweight and
Biosourced Solutions
for Cars' Interiors*

17:40 End of Conference

CHAIRMAN



FEMTO-ST Institute 
Dr. Ing. Vincent Placet

CHAIRMAN



**Fraunhofer-Institute for
Wood Research (WKI)** 
Dr. Arne Schirp

The Biocomposite Award 2017

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Six companies are nominated for the “**Biocomposite Award 2017**”: The Biocomposite Award highlights products that entered the market in 2017 or are just about to be launched.

Producers and inventors of innovative, new applications for WPC and NFC were invited to hand in their applications to the “Biocomposite Award 2017”. Each of the nominated companies will give a short 10-minute presentation on its new material and product on the first day of the conference. Following the presentations, the audience will elect the three winners.

The winner will be awarded in the first evening of the conference during the gala dinner.



1. BASF SE & Sonae Arauco Deutschland AG

3D moldable Medium Density Fibreboard (MDF)



Dr. Michael Kalbe

The innovative 3D mouldable MDF provides the furniture industry with a new wood-based material. It is a thermoplastic processable and storage-stable composite which can be produced on existing MDF production lines. In contrast to standard thermoset boards, it offers post-mouldability and surface structuring of the composites on standard equipment in short cycle times. Due to the increased mouldability of the composite, new design options are possible. The resin system is offered formaldehyde free.



2. G.S. Stemeseder GmbH

GS Stratos® passive (sandwich window scantling system)



Bernhard Mösl

GS Stratos® passive is a combination of a foamed PP and wood composite material with solid wooden elements. The system was developed for the building of passive house windows. Through the reduction in density of approximately 50%, the required specific heat conductivity and Uf-value of $\leq 0.8 \text{ W/m}^2\text{K}$ were achieved. The components are produced with standard machinery and tools of the wood industry and are certified combustible.



3. GreenBoats

GreenBente24



Friedrich J. Deimann

Usually, mass produced boats are made of fossil-based resins, glass fibres and plastic foam. By contrast, GreenBente24 from GreenBoats (DE) is made from 80% out of renewable materials like flax, cork and bio-based epoxy resin. The GreenBente24 has the same weight and stiffness as a standard boat. The boat achieves a 80% reduction of carbon footprint compared to other options and is thermally recyclable.



4. Raimund Beck Nageltechnik GmbH

LignoLoc® – Collated wooden nails



Dr. Hans Korte

Nails made from wood are one of the oldest known fasteners in the world, thus Raimund Beck Nageltechnik GmbH (AT) has initiated the next evolution stage LignoLoc® – collated wooden nails for use with pneumatic nailers. This new technology requires no pre-drilling; offers maximum holding power due to a natural welding effect with the base wood and offers new application fields for domestic beech wood-based composite.



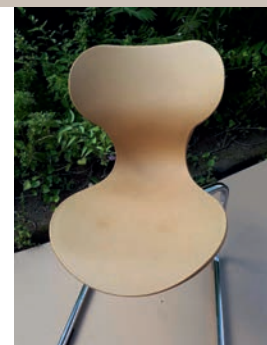
5. OWI GmbH

Injection moulded biocomposite school seat shell



Bernd Köhler

OWI GmbH (DE) launched an injection moulded school seat shell. The polypropylene (PP) and wood-based granulates were developed by Linotech GmbH (DE). The chair combines properties such as positive haptics – comfortably soft and warm to the touch – and standard PP chair requirements in terms of flex behaviour, notch impact strength and staple taking properties for upholstery, and stress load cycles without breakages.



6. TU/e Eindhoven

Fully Bio-based Bridge

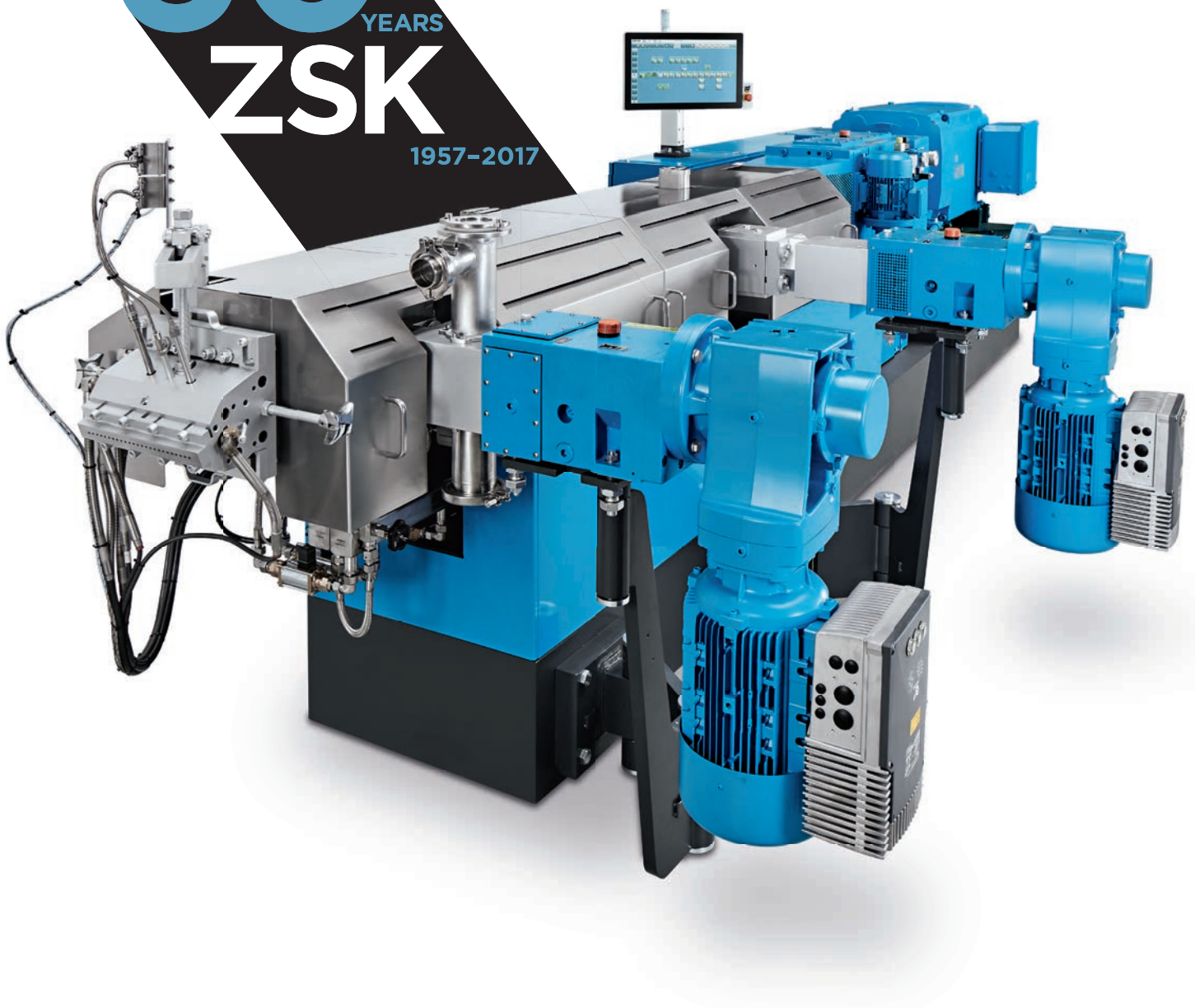


Prof. Dr.
Patrick Teuffel

A fully bio-based pedestrian bridge, the first in the world, has been realised at the Eindhoven University of Technology (TU/e) (NL). After a successful load test (5.0 kN/m²), the bridge was installed by the company NPSP bv (NL). Flax and hemp fibres provide the strength for the bridge, combined with a bio-based epoxy resin. Polylactic acid (PLA) bio-foam provides the core. The production method was vacuum-infusion: layers of natural fibres were glued around a laser-cut shape of bio-foam.



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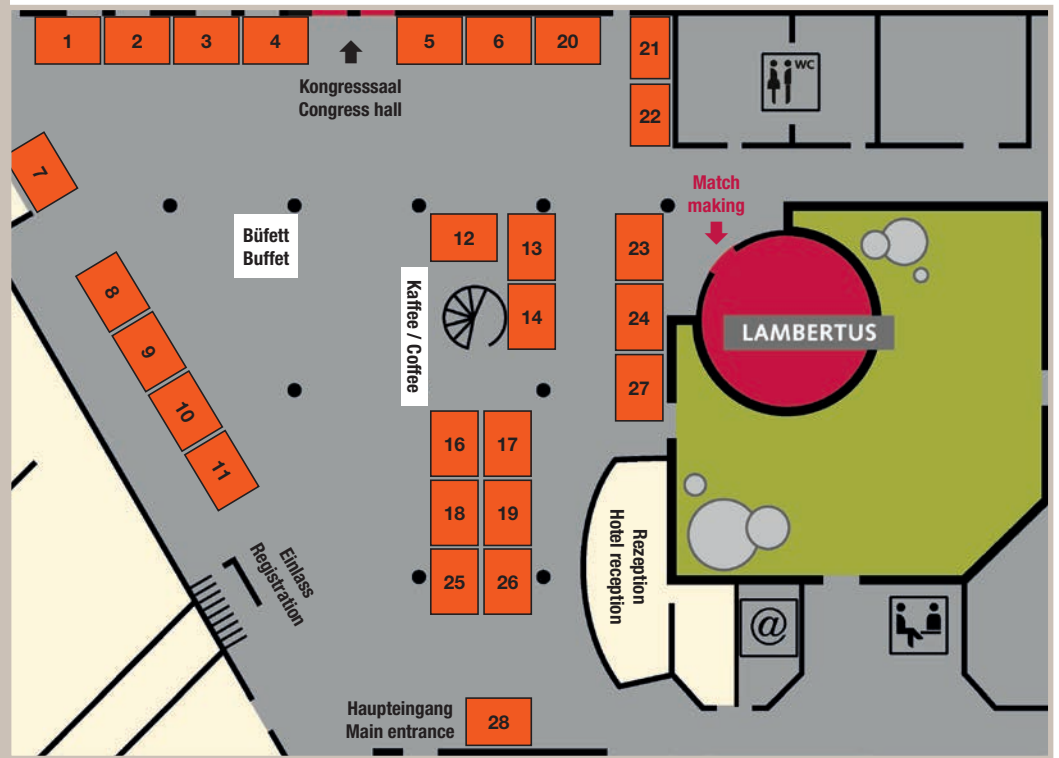
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- » Max. specific torque of 18 Nm/cm³
- » Very high throughput rate
- » Maximum product quality
- » Extremely broad spectrum of applications





Booths/Exhibitors

- No. 1: VTT Technical Research Centre of Finland Ltd 
- No. 2: Elastopoli Oy 
- No. 3: Fraunhofer WKI & Fraunhofer UMSICHT 
- No. 4: ENTEX Rust & Mitschke GmbH /
NOVO-TECH GmbH & Co. KG 
- No. 5: J. Rettenmaier & Söhne GmbH + Co. KG 
- No. 6: Der Grüne Punkt – Duales System Deutschland GmbH 
- No. 7: Hans Weber Maschinenfabrik GmbH 
- No. 8: i-Compology Corporation 
- No. 9: Harold Scholz & Co. GmbH 
- No. 10: Coperion GmbH 
- No. 11: FKUR GmbH 
- No. 12: Kompetenzzentrum Holz GmbH 
- No. 13: Wöhler Technische Bürsten GmbH 
- No. 14: Fibres Recherche Développement 
- No. 16: Innovation Award “Biocomposite of the Year 2017”
- No. 17: pelletroneurope GmbH 
- No. 18: RENOLIT GOR S.p.A. 
- No. 19: Fachagentur Nachwachsende Rohstoffe e. V. (FNR) 
- No. 20: nova-Institut GmbH 
- No. 21: European Industrial Hemp Association (EIHA) 
- No. 22: RISE – The Swedish Research Institute 
- No. 23: SIMCON kunststofftechnische Software GmbH 
- No. 24: Beck Service GmbH & Co. KG 
- No. 25: Time Out Composite oHG 
- No. 26: IN-BETWEEN INTERNATIONAL 
- No. 27: ADD – Chem Germany GmbH 
- No. 28: SMT Expo 2018 



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Natural fibre-reinforced plastics: establishment and growth in niche markets

More than 30 compound companies produce over 80,000 tonnes of granulates with wood and natural fibres in Europe 2017 – new producers with major growth plans

Authors: Michael Carus and Dr. Asta Partanen

There are many reasons to fill or reinforce plastics with wood or natural fibres of all kinds. Optical and haptic reasons play a role when it comes to differentiating products from standard plastic products. Especially in household goods, consumer goods and toys attributes like optics, haptics and a green image are important considerations. Weight savings, shorter cycle times, scratch resistance and a lower CO₂ footprint play a crucial role in technical applications and in the automotive industry. And, in combination with biodegradable plastics, products are also manufactured for agriculture and horticulture as well as for special applications such as filter balls and coffee capsules.

Today, in addition to experienced component manufacturers who have been offering a wide variety of biocomposites for years, there are new suppliers on the market who want to use innovative technologies to produce and market even better granulates.

Over 30 compound producers from Europe offer hundreds of recipes

In total, more than 30 compound producers from Europe with different polymers and natural fibres are currently producing several hundred recipes. Common petrochemical plastics are PP, PE, PVC and TPE/TPS. More and more often biopolymers such as Bio-PE, PLA, PBS, PBAT or PHA are used. Depending on the target application, natural fibres also contain wood flour, wood fibres, cellulose fibres, bast fibres such as hemp, flax, jute or kenaf, but also bamboo, cork or the fibres of the sunflower seed shells. The fibre content for injection moulding granulates is usually between 20% and max. 50%, with extrusion contents of up to 80% are possible.

At Fakuma in Friedrichshafen, Germany, the world's largest plastics and granulate trade fair, more than 20 exhibitors offering biocomposites were among the nearly 1,900 exhibitors in October 2017.

The following table tries to list the most important European suppliers of wood and natural fibre filled and reinforced plastic granulates with their production quantities in 2017. Only a few manufacturers are able to produce and sell quantities of 10,000 t per year or more. The largest producer is the Portuguese company Amorim with its cork granulates, which are used in shoe soles, handles and even in space travel. Many producers are still below 1,000 t/year or even only 500 t/year, although some of them, marked in the table with „NEW“, have very substantial growth plans. Over the next few years, additional capacities of more than 50,000 to 300,000 tonnes are planned to be built. This estimation might not be unrealistic as quality and prices have improved steadily over the last few years and many granulates have an attractive price-performance ratio today.

On the other hand, new producers have not succeeded in establishing quantities of more than 20,000 or even 50,000 t/year on the market in recent years. For this reason, some players have withdrawn from the market (Borealis, A. Schulman), while others have corrected their plans downwards significantly (Mondi, PolyOne, UPM).



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Major producers and suppliers of wood and natural fibre filled and reinforced plastic granulates with their production quantities in Europe in 2017

Granulate Producer	Country	Polymers	Fibres	Production range 2017 in tonnes
AMORIM	PT	PP, TPE/TPS	Cork	20,000 – 50,000
Beologic	BE/AT	ABS, PC, PE, PHA, PHB, PLA, PMMA, PP, PS, PVC, SAN, TPE	Wood and natural fibres and others	10,000 – 20,000
Tecnaro	DE	Lignin, PE, PP, PLA, PP, PBS, PBAT	Wood and natural fibres	5,000 – 10,000
Advanced Compounding	DE	PA, PE, PP	Wide range of natural fibres	1,000 – 5,000
Golden Compound	DE	PP, Biopolymers	Fibres from sun flower shells	1,000 – 5,000
Jelu Werke	DE	PP, Biopolymers	Wood and natural fibres and others	1,000 – 5,000
Pinuform	DE	PE	Wood	1,000 – 5,000
Plasticwood	IT	PP	Wood	1,000 – 5,000
Biowert	DE	PE, PP, PLA	Grass fibres, flax	500 – 1,000
FKuR	DE	Bio-PE, Bio-TPE, PHA, PLA, PP	Bamboo, wood, corc	500 – 1,000
Hexpol	SE	TPE	Cork	500 – 1,000
Rhenoflex	DE	Polyester, PLA, PP, TPU	Corn cob, wood, rice husks, straw	500 – 1,000
UPM	FI	PP	Cellulose fibres	500 – 1,000
Werzalit	DE	PP	Wood	500 – 1,000
Addiplast	FR	PP	Wood and natural fibres, cellulose fibres	< 500
Aqvacomp	FI	PP	Cellulose fibres	< 500 NEW
GreenGran	NL	PP, biopolymers	Natural fibres	< 500
HempFlax	NL	PP, PLA	Natural fibres	< 500 NEW
Linotech	DE	PP, PLA	Wood and natural fibres	< 500
Mondi Paper	AT	PP	Cellulose fibres	< 500
PolyOne	USA/EU	PP	MDF wood fibre	< 500
Sappi	SA/DE	PP	Cellulose	< 500 NEW
Transmare	NL	PP, PLA	Wood, bamboo and natural fibres	< 500
Total	EU			80,000

Number of applications and total production continues to rise steadily

Overall, it is clear that the number of applications and total production are increasing, but growth rates are lower than expected and total volumes are only slowly moving into larger dimensions.

The nova-Institute's current estimate is around 80,000 tonnes of natural fibre granulates produced and traded in Europe in 2017, which would mean a doubling compared to 2012.



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However, it may take a few more years before quantities of several hundred thousand tonnes are reached.

The following examples illustrate the ongoing establishment of the market as well as a large number of new, attractive applications.

IKEA (Sweden) has reintroduced the WPC chair “PS 2012”, but now with a significantly improved WPC granulate (Wood-Plastic Composite). In addition, the company also offers other products made of wood-plastic composites, including picture frames and another chair “ODGER” made of a wood-plastic composite. The special feature of this chair is that no tools are required to assemble the chair - the seat and base are easily assembled by a simple mechanism below the seat. The chair’s matrix material is a recycled plastic material.

There is also a new application in the consumer electronics sector – in a product group where acoustic properties are key to success. With LG Electronics using the cellulose-based granulate Aqvacomp, for the first time one of the market leaders utilizes a biocomposite material for the production of speaker cabinets. The material shall also be used in the automotive industry in the future. The cellulose-based granulates from the South African company Sappi are also targeting this market.

Advanced Compounding from Germany produces naturally antibacterial granulates made of PLA and pine wood, which are used for door handles and toys. Other innovations include the use of pine chips in industrial bread baskets and antibacterial packaging for shampoo bottles. Mock brings its new grain mill „Mockmill 100“ with a casing made of Tecnar’s PP-wood granulate to the market. Until now, Mock has not used any plastics for its casings, but only wood.

The Belgian compounder Beologic demonstrated the use of recycled materials at Fakuma in form of flower pots made of recycled denim fibres and also as wine coolers and crates for grape harvest made of grapevine granulates.

The total European biocomposite production reached 410,000 tonnes in 2017. Yearly growth rate is 3% – highest growth rate of 30% found in innovative fields ranging from technical applications over furniture up to consumer goods

The total biocomposite production in Europe is estimated to amount to 410,000 tonnes in 2017, compared to 357,000 tonnes in 2012 (see table). The overall annual growth rate of the European biocomposite production is about 3%, which is roughly in line with the average growth of the plastics market. But much higher growth rates of up to 30% have been identified in various innovative application fields of biocomposites. These application fields range from technical applications over furniture to consumer goods that are produced mainly with injection moulding, 3D and other production methods like rotomoulding. Furthermore, in the area of traded granulates the overall growth rate has also been substantially higher as the average (15%).



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Biocomposites (NFC, WPC & others)	2012	2017	CAGR in % from 2012 to 2017
Decking, siding and fencing, mainly extrusion	190,000	200,000	1
Automotive, mainly compression moulding	150,000	150,000	0
Technical applications, furniture and consumer goods, mainly injection moulding, 3D and others	17,000	60,000	29
Total	357,000	410,000	3
<i>The total figure includes: Produced and traded granulates for injection moulding and extrusion</i>	<i>40,000</i>	<i>80,000</i>	<i>15</i>

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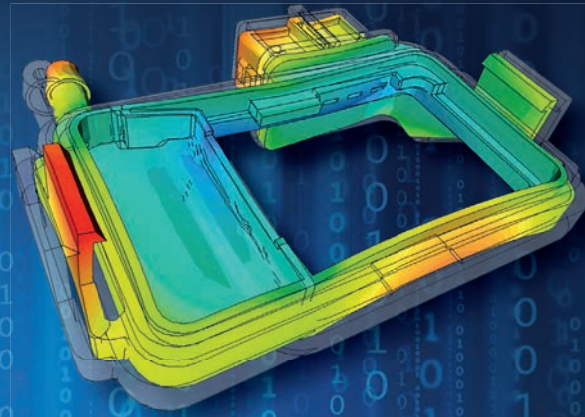
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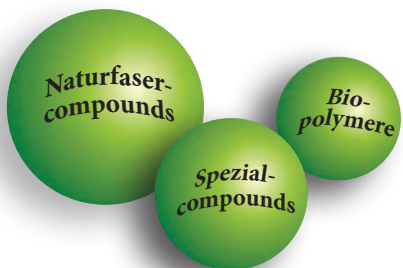
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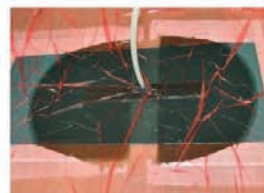
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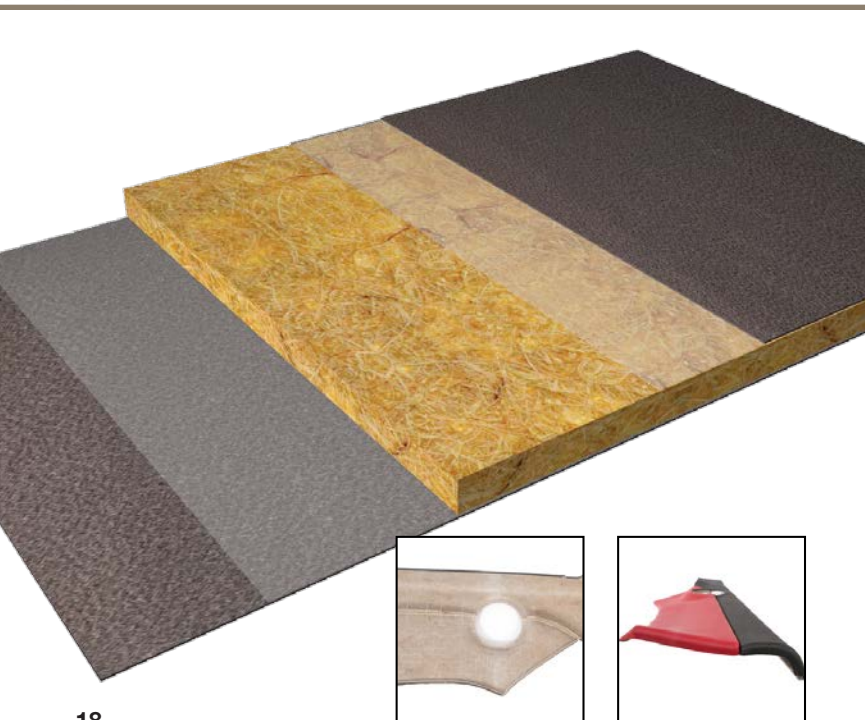
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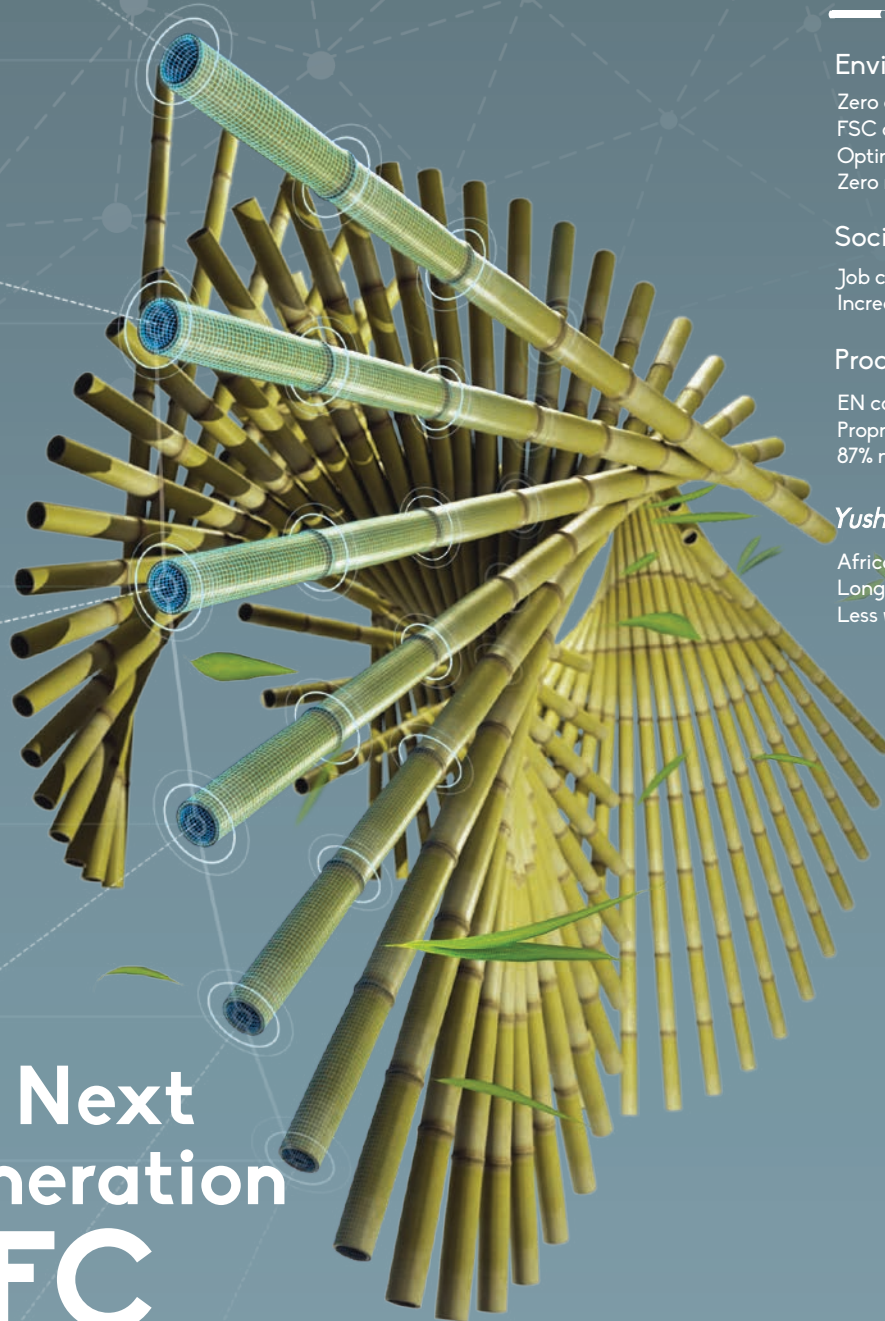
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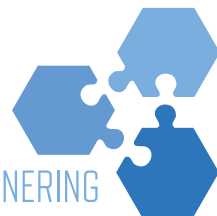
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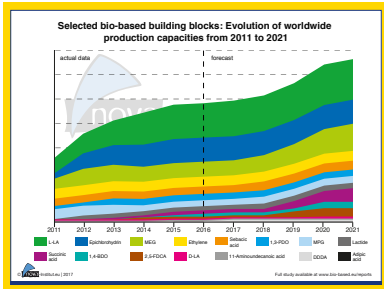
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Commercialisation updates on bio-based building blocks



Author: Doris de Guzman, Tecnon OrbiChem, United Kingdom
July 2017

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Standards and labels for bio-based products



Authors: Lara Dammer, Michael Carus and Dr. Asta Partanen
nova-Institut GmbH, Germany
May 2017

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Bio-based polymers, a revolutionary change

Comprehensive trend report on PHA, PLA, PUR/TPU, PA and polymers based on FDCA and SA: Latest developments, producers, drivers and lessons learnt



Author: Jan Ravenstijn, Jan Ravenstijn Consulting, the Netherlands
April 2017

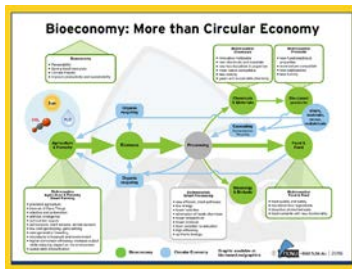
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Policies impacting bio-based plastics market development

and plastic bags legislation in Europe



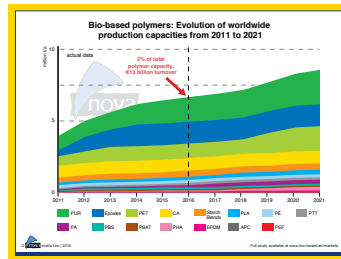
Authors: Dirk Carus, Clever Consult, Belgium
Jim Philip, OECD, France
Dr. Harald Kaeb, naroon Innovation Consulting, Germany
Lara Dammer & Michael Carus, nova-Institute, Germany
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Global Capacities and Trends 2016-2021

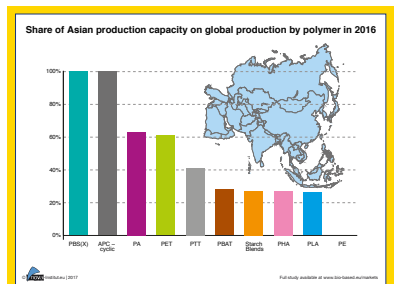


Authors: Florence Aeschelmann (nova-Institute),
Michael Carus (nova-institute) and ten renowned international experts
February 2017

This is the short version of the market study (249 pages, € 2,000).
Both are available at www.bio-based.eu/reports.



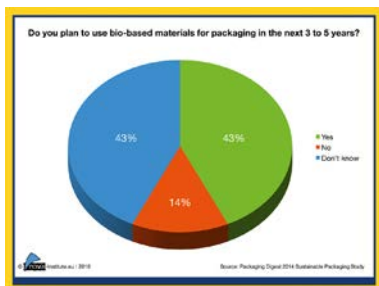
Asian markets for bio-based chemical building blocks and polymers



Author: Wolfgang Baltus, Wobalt Expedition Consultancy, Thailand
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Brand Views and Adoption of Bio-based Polymers



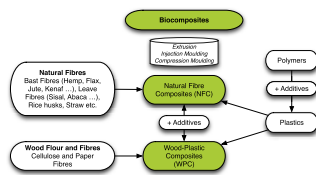
Author: Dr. Harald Kaeb, naroon Innovation Consulting, Germany
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WPC/NFC Market Study 2014-10 (Update 2015-06) Wood-Plastic Composites (WPC) and Natural Fibre Composites (NFC):

European and Global Markets 2012 and Future Trends in Automotive and Construction



Authors: Michael Carus, Dr. Asta Eder, Lara Dammer, Dr. Hans Korte, Lena Scholtz,
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