Biocomposites Conference Cologne
7th Conference on Wood and Natural Fibre Composites
6–7 December 2017, Maternushaus, Germany

CONFERENCE JOURNAL

- Biggest global meeting place for biocomposites
- The world’s most comprehensive biocomposites exhibition
- Vote for “Biocomposite of the Year 2017”
- Gala dinner and other excellent networking opportunities

Silver Sponsor
Der Grüne Punkt
www.gruener-punkt.de

Bronze Sponsors
http://fkur.com
www.fr-d.de
www.linotech.de
www.renolit.com
www.simcon-worldwide.com
www.vttresearch.com

Picture ©: top left: photo and design by colorFabb, top right: Faurecia, bottom left: Coperion, bottom right: photo by colorFabb, design by LeFabshop
Table of Contents

Seventh Biocomposites Conference Cologne .......................... 3
Programme | 1st Day | 6 Dec. 2017 ............................................. 4
Programme | 2nd 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

Members of the BCC Team

- Michael Carus
  Managing Director
  Phone: +49 (0) 22 33/48 14-40
  michael.carus@nova-institut.de

- Dr. Asta Partanen
  Programme, Sponsors, Composite Award
  Phone: +49 (0) 22 33/48 14-59
  Mobil: +49 (0) 151/11 13 01 28
  asta.partanen@nova-institut.de

- Dominik Vogt
  Exhibition, Communication
  Phone: +49 (0) 22 33/48 14-49
  dominik.vogt@nova-institut.de

- Vanessa Kleinpeter
  Contact, Registration, Organisation
  Phone: +49 (0) 22 33/48 14-40
  vanessa.kleinpeter@nova-institut.de

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 Hoffherr | 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.”
Conference Programme
1st Day, 6 December 2017, 9:30 a.m. – 6 p.m.

CONFERENCE OPENING
9:50 nova-Institut GmbH
Michael Carus
Conference Opening

WOOD-PLASTIC COMPOSITES
10:00 German Wood-Based Panel Industry (VHI)
Anemon Strohmeyer
NATURinFORM GmbH
Horst Walther
Overview of the German Wood-Plastic Composite Industry

10:20 WPCC 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

15:20 COFFEE BREAK

15:50 Dr. Hans Korte
Innovationsberatung Holz & Fasern
Dr. Hans Korte
X-Plorator – High Throughput Technology for Rapid Compound Development

16:30 Kompetenzzentrum Holz GmbH
Dr. Claudia Pretschuh
Regenerated Cellulose Fibres TENCEL® FCP as Filler in PP for Improved Foam Injection Moulding

16:10 Elastopoli Oy
Markku Nikkilä
Simcon kunststofftechnische Software GmbH
Dr. Paul F. Filz
Injection Moulding and Simulation of Consumer Products with Aqvacomp Composites

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

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

17:50 OWI GmbH
Bernd Köhler
Injection Moulded Biocomposite School Seat Shell

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

BIOCOMPOSITES IN 3D PRINTING AND DESIGN

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

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

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

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

11:00 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

13:50 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

16:00 VTT Technical Research Centre of Finland Ltd.
Kirs Immonen
Biocomposites from Side Streams of Paper and Board Industry – Fibre Clay 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
The Biocomposite Award 2017

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)

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)

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 ≤ 0.8 W/m²K were achieved. The components are produced with standard machinery and tools of the wood industry and are certified combustible.

3. GreenBoats

GreenBente24

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 and thermally recyclable.
4. Raimund Beck Nageltechnik GmbH

**LignoLoc® – Collated wooden nails**

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.

![Dr. Hans Korte](image)

5. OWI GmbH

**Injection moulded biocomposite school seat shell**

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.

![Bernd Köhler](image)

6. TU/e Eindhoven

**Fully Bio-based Bridge**

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.

![Prof. Dr. Patrick Teuffel](image)
60 years ZSK - 60 years twin screw extruder. Global market leader thanks to continued innovation and development.

www.coperion.com
New, compact version of the successful ZSK Mc\textsuperscript{18} twin screw extruder. Impressive features now on offer from the new ZSK Mc\textsuperscript{18} compact include a significantly reduced footprint, quick start-up, and convenient handling – making it a guarantee for success in an extremely broad spectrum of applications. 

www.coperion.com

THE ZSK Mc\textsuperscript{18}:

- Max. specific torque of 18 Nm/cm\textsuperscript{2}
- 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: FKnR 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
<table>
<thead>
<tr>
<th>Sponsor Biocomposite Award</th>
<th>Silver Sponsor</th>
<th>Organiser</th>
</tr>
</thead>
<tbody>
<tr>
<td>coperion</td>
<td>DerGrünePunkt</td>
<td>nova institute</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bronze Sponsors</th>
</tr>
</thead>
<tbody>
<tr>
<td>FKÖR</td>
</tr>
<tr>
<td><a href="http://www.fkor.com">www.fkor.com</a></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Partners</th>
</tr>
</thead>
<tbody>
<tr>
<td>AK</td>
</tr>
<tr>
<td><a href="http://www.ak-fre.de">www.ak-fre.de</a></td>
</tr>
<tr>
<td>DR. HANS KORTE</td>
</tr>
<tr>
<td><a href="http://www.hans-korte.de">www.hans-korte.de</a></td>
</tr>
<tr>
<td>Kunststoffland NRW e.V.</td>
</tr>
<tr>
<td><a href="http://www.kunststoffland-nrw.de">www.kunststoffland-nrw.de</a></td>
</tr>
<tr>
<td>VHI</td>
</tr>
<tr>
<td><a href="http://www.vhi.de">www.vhi.de</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Media Partners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bio Based Press</td>
</tr>
<tr>
<td>bioplastics</td>
</tr>
<tr>
<td>Holz-Zentralblatt</td>
</tr>
<tr>
<td>NetComposites</td>
</tr>
<tr>
<td><a href="http://www.netcomposites.com">www.netcomposites.com</a></td>
</tr>
<tr>
<td>Technology Review</td>
</tr>
</tbody>
</table>
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).
Major producers and suppliers of wood and natural fibre filled and reinforced plastic granulates with their production quantities in Europe in 2017

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

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.
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 Tecnaro’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%).

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

Bio-based thermoplastic elastomers for products with smooth surfaces and haptics.

www.fkur.com

Expertise from idea generation to market-ready applications

Are you looking for new business opportunities outside your own core competence? By complementing your own R&D expertise, VTT supports your concept, process and new product development with over 20 years of experience in biocomposite research. VTT’s top offerings to the biocomposite sector:

- Biopolymer and fibre foams
- High-performance thermoplastic fibre composites
- Modification of wood and agro based fibres (physical, chemical and enzymatic)
- Development of renewable based biopolymers and additives
- Development of biocomposites from side streams
- Biomaterial process development

If you are interested in collaboration, please contact:

Laura Kela
Key Account Manager
+358 40 544 2741
laura.kela@vtt.fi

Lisa Wikström
Research Team Leader
+358 40 861 4421
lisa.wikstrom@vtt.fi

VTT Technical Research Centre of Finland Ltd is one of the leading contract research organisations in the Nordic countries. VTT provides research and innovation services for domestic and international customers and partners.

www.vttresearch.com
RENOLIT NATGOR

A composite material based on a multilayer structure composed of extruded polyolefin layers and embedded natural fiber.

Andrea Strignano, Product Manager | Phone: +39.0121.569562
Engineered Tropical Bamboo

Material + Energy Efficient Engineering

Environmentally Sustainable
- Zero carbon footprint
- FSC compliant supply chain
- Optimized energy efficient processes
- Zero residual waste from supply chain to end product

Socially Inclusive
- Job creation for 6,000 farmers
- Increasing income levels by 2.5x ($0.98/day - $2.60/day)

Product Engineering
- EN compliant premium products (EN 15534; EN 16575)
- Proprietary energy efficient production process
- 87% natural fiber product

Yushania Alpina
- African highland bamboo
- Long fiber
- Less wax and silica than Moso

Meet our founders now

info@african-bamboo.com

More Information

www.african-bamboo.com/strategicpartners
Bunt ist das neue Grün.

Weil die Möglichkeiten des Gelben Sacks so vielfältig sind wie sein Inhalt. Er ist Rohstoffquelle für hochwertige Recyclingprodukte – wie zum Beispiel Systalen, das Premiumrezyklat vom Grünen Punkt.

HIGHLIGHTS OF THE WORLDWIDE BIOECONOMY

- Feedstocks for the Bio-based Economy
- Bio-based Building Blocks & Polymers
- Lignocellulose – Lignin & Cellulose
- Environmental Solutions
- Yeast as Platform Technology for Bio-based Chemicals
- Start-up Session

The 11th International Conference on Bio-based Materials is aimed at providing international major players from the bio-based building blocks, polymers and industrial biotechnology industries with an opportunity to present and discuss their latest developments and strategies. The conference builds on successful previous conferences: 250 participants and 30 exhibitors are expected.
More than 300 participants from 40 countries are expected – don’t miss the biggest industrial hemp event in 2018 worldwide!

Applications
• Bio-Composites
• CBD as Food Supplement and Pharmaceutical
• Construction
• Fibres & Shives
• Hemp Seeds, Oil and Proteins
• Insulation
• Textiles

Spectrum of Participants
• Cultivation Consultants
• Engineers
• Hemp Food and Feed Industry
• Natural Fibre Industry
• Pharmaceutical Industry
• Research and Development
• Traders and Investors
Gene Editing, CRISPR/Cas and more for the Bio-based Economy

What do modern biotechnology and especially gene editing via CRISP/Cas9 and similar technologies mean for the bio-based economy? What do these new concepts mean in terms of technology, politics and public perception?

nova-Session, 6 March 2018, www.bio-based.eu/nova-sessions

15 – 16 March 2018
Maternushaus, Cologne, Germany
www.co2-chemistry.eu

12 – 13 June 2018
Maternushaus, Cologne, Germany
www.eiha-conference.com

15th International Conference
European Industrial Hemp Association (EIHA)
15th International Conference | 12th - 13th June 2018

International Directory for Bio-based Businesses (iBIB)
Easy and direct access to producers, suppliers and experts in the Bio-based Economy worldwide.
Upload your company profile now for free, get visible for thousands of customers!
www.bio-based.eu/IBIB

Contact: Mr. Dominik Vogt, +49 (0) 2233 48 14 49, dominik.vogt@nova-institut.de
All conferences at www.bio-based.eu
Bio-based Polymers & Building Blocks
The best market reports available

www.bio-based.eu/reports