

5th edition

# iBIB2014/15

International **B**usiness Directory for  
Innovative **B**io-based Materials



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### Edition

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## OUR iBIB MEDIA

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### Partnership between iBIB and Agrobiobase: cross-links and special subscription rates

We are delighted to offer our iBIB customers additional services to support their marketing activities: nova-Institute (Germany) and the French Competitiveness Cluster Industries and Agro-Resources (IAR) in Laon (France) have signed a partnership agreement that links iBIB customers to IAR's Agrobiobase and its biomaterials database on bioplastics, natural fibres and biocomposites ([www.agrobiobase.com](http://www.agrobiobase.com)). Customers who subscribe to both iBIB and Agrobiobase will be automatically cross-linked between both entries.

## EDITORIAL

Welcome to iBIB<sup>2014/15</sup>, the 5<sup>th</sup> edition of the unique worldwide business directory for innovative bio-based materials!

### Make sure you are visible and findable in the bio-based world!

The market for bio-based materials continues to show double-figure growth rates and has now gained true international status. iBIB<sup>2014/15</sup> enables industrial suppliers and customers to get in touch with each other. It contains information about 65 major companies, associations and R&D organisations from 15 countries on 4 continents.

New markets such as bio-based plastics, composites, intermediates and green additives are mostly based on "insider knowledge" and therefore lack transparency. This in turn harms the steady growth of the sector. iBIB<sup>2014/15</sup> helps companies and institutes to find the best bio-based solutions available worldwide.

The last issue reached almost 100,000 potential clients via the huge, worldwide bio-based network of nova-Institute and bioplastics MAGAZINE:

- The print version (10,000 copies) was distributed by the publishers and their partners at trade shows, exhibitions and conferences worldwide.
- The PDF and iPad version was distributed widely by email and through websites (ca. 12,000 downloads).
- The online database includes a detailed index to help you reach your supplier in the most targeted way (more than 65,000 single company profile downloads).
- Extended coverage through further distribution by customers and their networks, word-of-mouth advertising etc.

At [www.bio-based.eu/iBIB](http://www.bio-based.eu/iBIB), you have free and direct access to the database with more than 100 specific search criteria and a complete list of company profiles. The full PDF version is also available for free under this link.

Take a look at the hundreds of different bio-based solutions for almost every conceivable application and industry sector. The bio-based revolution is already under way. Be part of it!

### Potential subscribers:

Make sure you are visible and findable in the next issue or immediately in the online database! Please contact [barbara.dommermuth@nova-institut.de](mailto:barbara.dommermuth@nova-institut.de)

Kind regards



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Managing Director of nova-Institute



Dr. Michael Thielen  
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### Publisher



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Dr. Michael Thielen  
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bioplastics MAGAZINE



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## BIO-BASED PRODUCTS – THE DEFINITION & BIO-BASED LABELS IN EUROPE

### CEN/TC411 – prEN 16575 Bio-based products

CEN has developed various standards for bio-based products in the last few years (CEN/TC411 – prEN 16575 Bio-based products – is a draft standard; publication of the final EN standard is expected by September 2014). The authors summarise these standards as follows:

**Bio-based:** derived from biomass

**Biomass:** material of biological origin excluding material embedded in geological formations and/or fossilized

- Biomass can have undergone physical, chemical or biological treatment(s).
- The correct spelling of ‘bio-based’ is with a hyphen (‘-’). It is however in common usage sometimes spelt without a hyphen.
- The methods to determine and communicate “bio-based” as a characteristic are detailed in specific standards of CEN/TC 411.
- The commonly used biomass, also called bio-based resources, is starch, sugar, vegetable oils, (hemi) cellulose (timber, natural fibres, straw and other by-products) and special biomolecules such as lignin or natural rubber.

**Bio-based product:** product wholly or partly derived from biomass

- The bio-based product is normally characterised by the bio-based carbon content or the bio-based content. For the determination and declaration of the bio-based content and the bio-based carbon content, see the relevant standards of CEN/TC 411.
- Product can be an intermediate, material, semi-finished or final product. “Bio-based product” is often used to refer to a product which is partly bio-based. In those cases the claim should be accompanied by a quantification of the bio-based content.

More information on the CEN standardisation process can be found here: [www.cen.eu/cen/Sectors/Sectors/Biobased/Pages/default.aspx](http://www.cen.eu/cen/Sectors/Sectors/Biobased/Pages/default.aspx) [www.biobasedeconomy.eu/research/kbbpps](http://www.biobasedeconomy.eu/research/kbbpps)

### Bio-based labels in Europe

Bio-based carbon content is measured according to the ASTM D 6866 standard, and the radiocarbon measurement method has been in use in Europe since 2009. To be eligible for certification, materials must come from partially or completely renewable sources. The materials include biopolymers, bio-based plastics as well as biocomposites.

The “OK biobased” label for materials is certified by the Belgian agency Vincotte ([www.vincotte.com](http://www.vincotte.com)). The label has been available since 2009. A ranking system of one to four stars indicates the product’s bio-based carbon content. One star represents 20–40 %, two stars 40–60 %, three stars 60–80 %, and finally four stars (the highest ranking) corresponds to a bio-based carbon content of over 80 %.

TÜV Rheinland/DIN CERTCO (Germany) ([www.dincertco.de](http://www.dincertco.de)) offers a similar label “Biobased – DIN geprüft” that also uses the ASTM D 6866 standard and the radiocarbon measurement method. There are three ranges for “biobased” products: 20–50 %, 50–85 % and over 85 % bio-based carbon content.

Both certification systems require the product to have a bio-based carbon content of at least 20 % to qualify for certification.

Source: Carus, M., Eder, A. et al. 2014: Wood-Plastic Composites (WPC) and Natural Fibre Composites (NFC): European and Global Markets 2012 and Future Trends ([www.bio-based.eu/markets](http://www.bio-based.eu/markets))







# Suppliers





## ADVANCE NONWOVEN A/S

### Foundation

- 2006

### Turnover

- About 20 million €

### Employees

- 12

### Branches

- Agriculture & Horticulture
- Building & Construction
- Carpet & Flooring
- Consumer Goods
- Packaging

### Key materials

- Natural fiber
- Recycled synthetic fiber & granulate

### Key products

- Tailor-made products



### Our Company

The company was established in 2006 with the objective of creating commercial opportunities for sustainable products made from natural fibers and recycled waste.

Our vision is to develop, build and participate in operating manufacturing lines for sustainable nonwoven products.

Our core business is to engage in joint ventures around the world, where we provide know-how, development and full turnkey factory installation. We create joint venture opportunities through our business development activities.

The Company's equity is Dkr. 50m.

### Our Technology

Our patented CAFT – Carding Airlaid Fusion Technology – introduces unprecedented flexibility and capacity in air-laid/carding processing that literally is “game changing” in the industry.

The CAFT technology facilitates the use of sustainable resources creating a variety of new products.

### The Applications

A broad selection of products can be made with the CAFT technology ranging from thin tissue like textures to lofty structures and from low to high density compositions – all made from sustainable and/or renewable resources like natural fibres, either from a fibre crop or residuals from an agricultural production or from waste fragments or recycled material.

Products find a home in categories like: insulation material, growth media, absorption mats, composites, upholstery, filtration and packaging – among many other.





### Our Advantages

Traditional airlaid industry operates with 1 – 12 mm fibers and the traditional carding industry operates with 5 – 100 mm fibers. In both industries capacity will decrease as the fiber length increase.

Our CAFT technology operate with fibers in the length of 1 – 100 mm, thus covers both the mentioned industry standards and will maintain the capacity regardless of the fiber length – and CAFT can process homogeneous material as well as inhomogeneous materials.

This specification allows us to process traditional material and – more important – natural fibers or waste material at a high capacity, 2000 kg/h and up, unlike competing technologies.

Further, the final product range is broad – from millimeter thin products at 150 g/m<sup>2</sup> to centimeter thick products at 15000 g/m<sup>2</sup> – very versatile capabilities compared to competing technologies.



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## BAVE – BADISCHE FASERVEREDELUNG GMBH

### Foundation

- 2011

### Employees

- 6

### Branches

- Natural fibres industry

### Key materials

- Natural fibres

### Key products

- Ready to use pellets from natural fibres and different thermoplastics for injection moulding and extrusion



BAVE – Badische Naturfaserveredelung GmbH was founded in 2011 as partner company of BAFA – Badische Naturfaseraufbereitung GmbH. BAVE is specializes in pelletizing of natural fibres and also of ready to use pellets from natural fibres and different thermoplastics for injection moulding and extrusion.

A recent research and development project conducted in cooperation with the Deutsche Bundesstiftung Umwelt (German Federal Environmental Foundation), the nova-Institute and other members of the industry and research community addressed the crucial issue of how to condition and feed natural fibres so they can be used in injection moulding and extrusion processes. Specifically, the project evaluated, which of the available feeding techniques would optimize gravimetric dosing and dispersion in the compounding process. Pelletizing of natural fibres was eventually found to be the ideal feeding method.



BAVE's pelletizing process provides for variation in the composition of key raw materials and for the addition of various additives. This will achieve optimum pellet consistency and allow for control of the functional properties of the final product, according to customer demand.

We look forward to combining our multi-year know-how in the processing of natural fibres with your innovative ideas.



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Bernd Frank



BEOLOGIC NV

Foundation

- 2000

Employees

- <20

Branches

- Compound development
- Compounding
- Tooling

Key materials

- Natural fibers + PVC, PP, PE, ABS, PS, PLA, PHA, SEBS, TPE, ...

Key bio-based products

- Ready to use NFC compounds

Other products

- NFC extrusion tooling and water baths systems



Company

Since founding in 2000 as a strictly technologically focused company, Beologic is solely orientated in Natural fiber plastic Polymers.

Over the years, due to development and our service-focused policy, Beologic faced a significant growth, together with our customers.

Today we find ourselves as market- but much more as technology leader in supplying advanced NFC-compounds.

Beologic has now a capacity of 20,000 metric tons a year with the chance to increase the output dramatically in the coming years.

70 % of our NFC production is PVC based. The rest splits between PP, PLA, PHA, SEBS, TPE & others.

Our main aim is to supply standard sized, top quality NFC Compounds. We also supply tailor-made material solutions for our partners.

Since 2009 Beologic offers an extensive customer support supplying know-how in R&D, tooling, processing, product development and tool refurbishment

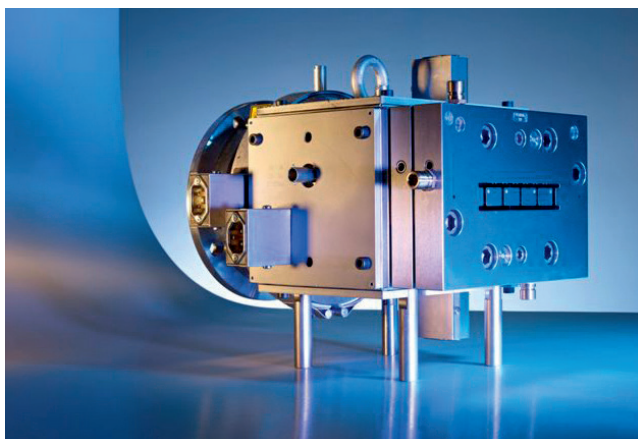
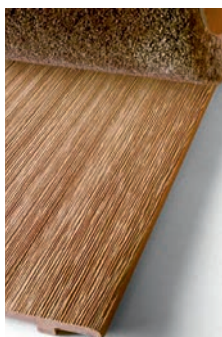
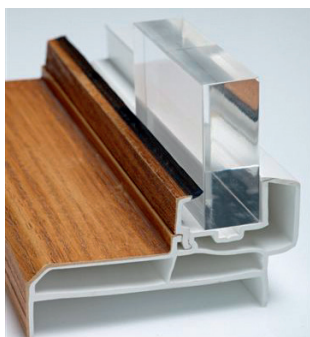
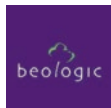
As we are 100 % service-focused, the Beologic team acts as a partner for our customers.

We would be pleased to meet you in the world of Beologic.

We are successful because our aim is to keep solutions simple but never compromise for price.



application	<u>PE</u>	<u>PP</u>	<u>PVC</u>	<u>ABS</u>	<u>PS</u>	<u>PLA</u>
<u>extrusion</u>	●	●	●			●
<u>injection</u>		●	●	●	●	●
<u>co-extrusion</u>		●	●			
<u>foaming</u>			●			
<u>rotomoulding</u>	●					



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## BIOPOLYNOV / NATUREPLAST

### Foundation

- NaturePlast: 2006
- Biopolynov: 2010

### Employees

- <10

### R&D

- Customized formulation

### Services

- Training course, technological study, project engineering

### Key products

- Supplier of all bioplastic raw materials



### NaturePlast

The NaturePlast group is dedicated to accompanying converters or end users in the transfer of technology into bioplastics (plastics made of plant origin, some being biodegradable). The head office of NaturePlast in Normandy, France, is the only company in Europe that supplies all internationally existing types of bioplastics (with near to one hundred producers) since 2006. We support innovative projects in all fields: packaging (food, cosmetics ...), horticulture, automotive, construction, toys ...

In addition to classic development based on plant fibers (wood, bamboo, miscanthus, hemp ...) we are developing a whole range of new bioplastics made from by-products (food and industrial). Since the creation of our R&D laboratory, Biopolynov, we have been developing new bioplastics based on fruit and vegetable pulp, stone powder (olive), leather waste, algae from French coasts, seashell powder ...

Apart from providing the material, NaturePlast offers other kinds of services as well:

- R&D (customized formulations, characterization, production of compounds)
- Training sessions
- Technical assistance
- Project engineering
- Market study

### Materials

NaturePlast has hundreds of grades of bioplastic raw materials (PLA, PHA, BioPET, PBS, Bioelastomers, BioPA ...) and compounds for all types of processes in its portfolio. We can also supply half finished products (films, rolls, sheets ...), additives and coloring agents.





## Biopolynov

Biopolynov is a R&D center created by NaturePlast in 2010, dedicated to the improvement and modification of bioplastics' properties. It remains the only European center of R&D dedicated to work on bioplastics.

Biopolynov is focusing on the development of customized materials according to your specifications, as well as on the characterization of biomaterials and the production of compound samples.

In addition to these services, Biopolynov's team accompanies your development in its every step (research of partners, creation of the book of specifications, certificates...)

Biopolynov is supported by NaturePlast's experience:

- Its know-how in the formulation domain: a team of engineers and doctors with a large experience in the modification of bioplastics' properties.
- Its knowledge of and access to different raw materials and additives: a large portfolio with hundreds of references.
- Its French and European network of research partners (technical centers, universities...) and industrials (suppliers, compounders, transformers...).

Link to Agrobiobase



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## BIOTEC GMBH & CO. KG

### Foundation

- 1992

### Branches

- Compounds, biodegradable and compostable resins

### Key materials

- Biologically sourced polymers such as PLA and potato starch

### Key bio-based products

- BIOPLAST, plant-based 100 % biodegradable bioplastic resins made from potato starch and other biologically sourced polymers.



### Company

BIOTEC is a leading company that develops and produces sustainable bioplastics made from plant-based renewable resources. Flexible and rigid applications range from refuse and shopper bags to pharmaceutical capsules, including food industry blisters, cosmetics packaging and many other products manufactured and produced to order.

BIOTEC bioplastic resins are sold under the brand name of BIOPLAST. Products made from all BIOPLAST grades are 100 % biodegradable and compostable according to EN 13432. In the fast-growing market of bioplastics, BIOTEC is a key player that offers credible and industry-scale biobased plastic solutions, with the objective of significantly reducing the use of fossil-based plastics.

### BIOTEC's know-how lies in 3 areas of expertise:

- Developing new formulations and being able to combine the physical properties of our components to reach specified properties.
- Compounding expertise: BIOPLAST specific properties not only depend on its composition, but significantly on the compounding technique used. BIOTEC has achieved outstanding proprietary know-how.
- Screw design: BIOTEC is able to design its own screw set-up in order to obtain new properties and has developed an exclusive pool of compounding units.

With its dedicated research team, BIOTEC is constantly improving the characteristics of BIOPLAST in terms of mechanical and barrier properties in order to meet the requirements of industry sectors such as cosmetics, food, agriculture, pharmaceuticals and others.

With an extensive sales network, covering most European countries, BIOTEC provides the finest customer service and technical support.

### Products

BIOPLAST are 100 % biodegradable bioplastic resins made from potato starch and other biologically sourced polymers.

BIOPLAST grades are designed to run on existing standard industrial equipment. They can be processed by extrusion plants manufacturing blown film, flat film, mouldings, profiles and injection moulded components to become fully biodegradable products. Over and above film applications such as bags and wrapping products, BIOPLAST resins can be used to manufacture products for the catering/fast food industry, foods and pharmaceuticals, healthcare, agriculture or the automotive industry.

For the entire BIOPLAST range, the company strives to achieve the highest possible proportion of biobased raw materials. The spectrum of biobased proportions starts at 23 % (BIOPLAST GF 106/02), rises to over 50 % (BIOPLAST 500) and peaks at 69 % (BIOPLAST GS 2189). Even the maximum proportion of 100 % is available with BIOPLAST TPS® the finest example.

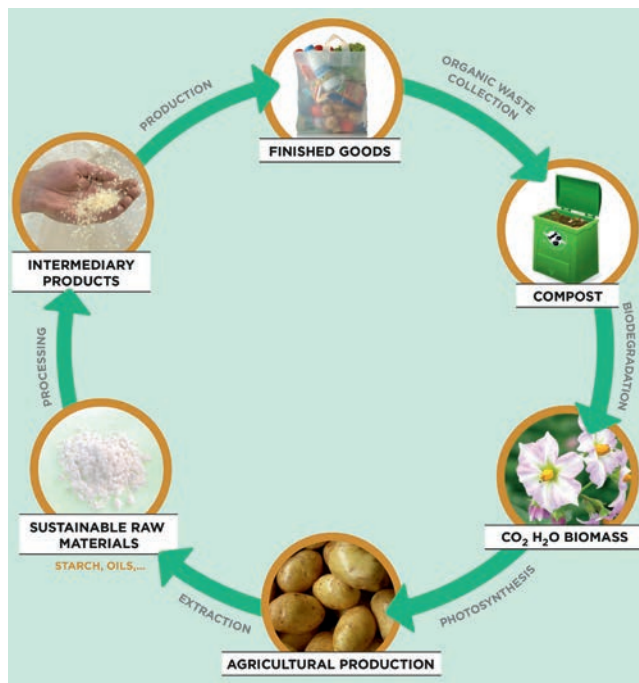


A new generation of plant-based polymers



Film application made from BIOPLAST





BIOPLAST a virtuous cycle

BIOPLAST resins are a relevant answer to environmental issues. The use of renewable resources by industry effectively saves fossil resources and reduces the amount of greenhouse gas emissions. With „OK compost“ certification, packaging made from BIOPLAST provides the most relevant end-of-life option in green waste collection systems.



Rigid application made from BIOPLAST

Link to Agrobiobase



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Peter Brunk





## BIOWERT INDUSTRIE GMBH

### Foundation

- 2005

### Employees

- 15

### Key materials

- Functional grass fibres isolated from grass silage

### Key products

- AgriCell<sup>BW</sup> – „blow-in“ insulation material
- AgriPlast<sup>BW</sup> – a composite material (fibre reinforced plastic) for injection moulding and extrusion techniques
- Products from AgriPlast<sup>BW</sup> are: terrace profiles, boxes, patress/wall boxes



# BIOWERT

bio based industry

### The Grass Factory

At Biowert everything revolves around the theme meadow grass. In our biorefinery we process this renewable resource into innovative products and green power. In Germany there's plenty of meadow grass. But our "grass factory" is worldwide one of a kind – and we continue to grow and develop it further. Our goal is to use our raw materials in a recycling process as complete as possible so that we generate no wastewater and waste products at all while using only a minimum of resources.



Our "grass factory" is worldwide one of a kind.



At Biowert everything revolves around the theme meadow grass.



Stacking boxes made from AgriPlast<sup>BW</sup>



GRPL a modular hanging system



# BIOWERT

bio based industry

## Composites

With certain plastics it's possible to replace up to 75 % of their oil-based materials through renewable resources. At Biowert the remaining part of the plastic too is made up of either recycled or biodegradable plastics. All of Biowert's composites can be dyed in various colours and equipped with flame-retardants according to your needs. They can also be delivered as granules or as ready-made products.

## AgriPlast<sup>BW</sup>

### AgriPlast<sup>BW</sup>

AgriPlast<sup>BW</sup> is a composite of plastics and cellulose. The cellulose is obtained from meadow grass. AgriPlast<sup>BW</sup> is nearly 25 % lighter than conventional injection-moulded plastics. As a result energy is saved during transportation. Moreover AgriPlast<sup>BW</sup> is ideal for recycling and in this way too helps reduce the consumption of raw materials.

- **AgriPlast 7525**, made of 75 % cellulose fibres, is particularly well suited for plastics extrusion and products such as terrace flooring, profiles and many others.
- **AgriPlast 5050**, made of 50 % cellulose fibres, is perfect for injection moulding and products such as stackable boxes, clips, pens, crates, lipstick tubes, designer objects and much more.

### Biowert FlaxPP

Biowert FlaxPP is a composite made out of pure flax and pure polypropylene. It's an especially good value because the material is won from the automobile industry's production residues. Biowert FlaxPP can be used, for example, in stackable boxes.



Biowert's Terrace Flooring  
made of AgriPlast<sup>BW</sup>

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## CAVAC BIOMATERIAUX

### Foundation

- 2009

### Employees

- <30

### Branches

- Natural fibres
- Industrial performance (defibering/burling)

### Key materials

- Natural insulation products
- Technical fibres (hemp, flax)
- Hemp chaff (hemp mortars, mulching garden, animal bedding)

### Key products

- Biofib'hemp® (hemp fibres)
- Biofib' duo® (hemp and flax fibres)
- Biofib'celulose® (hemp and cellulose fibres)
- Biofibat (hemp chaff)



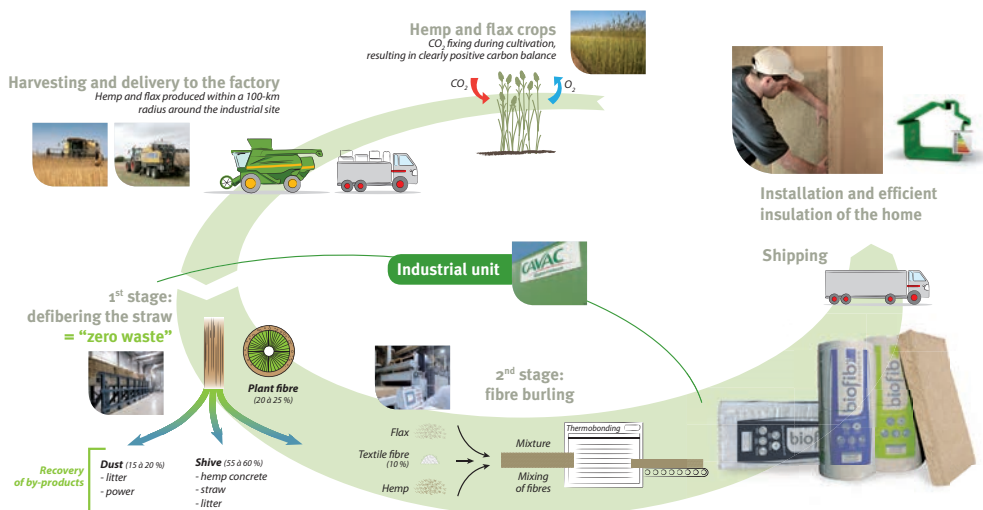
French manufacturer of biosourced materials  
Structural elements – Thermal and Acoustic solutions

### Company

Founded in 2009, Cavac Biomatériaux is a subsidiary of French agro-industrial cooperative group called Cavac, whose activities are based on cereals processing, feeding and animals growing in the west part of France (in Vendée one hour south from Nantes).

We go on to develop uses for straw and plant fibres to open up new markets for agro-materials. Our vision is that this type of products contribute significantly to a sustainable society. Cavac Biomatériaux claims to be unique in combining technical efficiency with setting an ecological example:

- A "hemp" crop that is renowned for its ecological virtues.
- A complete production chain: hemp and flax are grown by the farmers of our cooperative (and processed on one site).
- The quality of an industrial production that meets the expectations of our partners and customers.



The "from fields to site" chain



A whole range of limitless options...

#### Materials for insulation and building



A large range of insulation products with the brand Biofib'insulation

#### Automotive industry



Panels already manufactured using polyester wadding:

- Units to be formed (hemp and/or flax + bico)/thermoforming
- Mats to be used as is or cut to size
- Cotton felts (soundproofing applications)
- ... any "custom work" requiring a burling process.

#### Bioplastics industry



Decking  
manufactured with dry blend  
(micronized hemp chaff)



Picket and cup ...  
manufactured with compounds of  
hemp chaff or flax.



#### Industrial know-how & state-of-the-art equipment

- 2 separate production lines:
  - defibering of straws
  - burling involving up to 5 components: plant fibres (hemp, flax, cotton, etc.) and/or synthetic fibres (polyester wadding, etc.)
- Control of process and regularity of batches (heating tunnel, density sensor)
- 100 % automated line output: cutting/packaging/palletizing (thermoformed cover)
- 12,500 m<sup>2</sup> of covered storage area
- An in-house laboratory in charge of quality control (measurement of thermal performance/ lambda meter)
- A Research & Development department



#### Contact

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## CORBION PURAC

### Turnover

■ 753 million € (2012)

### Employees

■ 1,800



### About Corbion

Corbion is the global market leader in lactic acid, lactic acid derivatives and lactides, and a leading company in functional blends containing enzymes, emulsifiers, minerals and vitamins. The company delivers high performance bio-based products made from renewable resources and applied in global markets such as bakery, meat, pharmaceuticals and medical devices, home and personal care, packaging, automotive, coatings and coating resins. Corbion operates 10 production plants, in the USA, the Netherlands, Spain, Brazil and Thailand, and markets its products through a worldwide network of sales offices and distributors. In 2012, Corbion generated annual sales of €753 million and had a workforce of 1,800 employees. Corbion is listed on NYSE Euronext Amsterdam.

### Corbion in bioplastics

Corbion Purac produces Lactides from Lactic Acid, which our partners then convert to Poly Lactic Acid (PLA) thermoplastic resin. PLA is a compostable bioplastic suitable for a range of applications. Our most recent breakthrough in high heat PLA, which withstands temperatures up to 120 °C, unlocks bioplastic potential for durable applications such as automotive parts, clothing & carpet fibres & computer housings.

### Why PLA?

- Bio-based
- Low carbon footprint
- Multiple end-of-life options
- Available on an industrial scale
- Proven durable applications



The world's first bioplastic touch screen computer, developed by Corbion Purac partners: SUPLA and Kuender.





Injection molded parts, demonstrating high gloss, high scratch resistance and excellent colorability of PLA based on lactides from Corbion Purac.



High heat single-use coffee cups, made from PLA based on lactides from Corbion Purac.



Serviceware made from PLA based on lactides from Corbion Purac.

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## CRODA GMBH

### Foundation

- 1960 in Germany as a subsidiary of Croda International Plc.

### Turnover

- Croda International Plc.: 1,077 mio £ (2013)

### Employees

- 3,545

### Branches

- Speciality ingredients for high growth markets including Polymer additives

### Polymer Additives

- Diverse applications in polyolefins, PVC, styrenics, polyamides and biopolymers

### Key materials

- Additives from natural and renewable raw materials

### Key products

- Crodamide™, Atmer™, Incroslip™, IncroMold, Incroflo™, Solasorb™ & Syncroflex™

# CRODA

## Croda International Plc.

Founded in 1925 in Yorkshire, UK, Croda has developed its position as a leading speciality chemical company producing an unrivalled range of naturally derived products for industry. From personal care to polymer additives, home care to health care, lubricants to crop care, Croda technologies will be at the heart of the finished products. Headquartered in Cowick, UK, Croda International Plc. is represented in 35 countries globally. Croda GmbH is a subsidiary of Croda International Plc. and based in Nettetal, Germany. From this location we provide many renowned manufacturers and companies in Germany, the Benelux, Switzerland, Austria, Czech Republic and Hungary.

## Croda Polymer Additives

The business has grown in recent years to secure its status as leader in the global supply of naturally based speciality chemicals for the polymer industry. Croda are offering speciality additives into a wide range of polymers.

They provide the following effects: slip & anti-block, anti-fog, anti-static, mold release, pigment dispersion, torque release, UV-absorption, & speciality plasticisers.

## Continuous innovation

The Polymer Additives product range has continued to grow and now includes over 200 products. Croda has the widest range of products, product forms and packaging to meet customer needs.

In 2013 Croda acquired a 65 % equity interest in Sichuan Sipo Chemical Co. Ltd. Sipo manufacture speciality derivatives from natural raw materials and its products include primary amides, novel fatty acids and speciality esters. This investment demonstrates the commitment to meet the needs of the growing polymer market with slip additive technology. The acquisition of Sipo will further enhance Croda's global leadership of fatty acid amides. All our business is supported with global technical experts, high quality manufacturing facilities, local dedicated sales teams and stock-holding close to our customers to give the best possible customer support and service. Croda's innovation is a continuous process with new products being launched at regular intervals. As well as maintaining leadership in established areas Croda now offers unique products in non-organic UV-absorber and speciality plasticisers for the most demanding applications.

## Our green credentials

Croda takes environmental responsibilities very seriously and has in recent years achieved significant reductions in its carbon footprint, energy and water consumption.

## Carbon footprint

In the last 8 years, our manufacturing facility in Hull has reduced carbon emissions by over 50 %. Since the wind turbine was installed the site's imported electricity demand has reduced by 40 % and at full output the wind turbine will exceed the site's requirements and be exported to the electricity grid.



# CRODA

## Energy and water consumption

In the last 8 years similar improvements have been seen in energy and water consumption; nearly 60 % reduction in energy consumption and just over 60 % reduction in water consumption per unit of production.

## Other energy saving activities

Croda also minimizes its environmental impact through transport of raw materials. Rape oil is delivered to the site by barge, displacing approximately 1000 trips by road tanker avoiding subsequent traffic congestion and fuel consumption.

## Securing our future

The use of slip & anti-block additives in plastics is a practical requirement to bring easier processing and handling. However, performance needs in complex and consumer sensitive applications increasingly demand more from an additive.

## Incroslip SL– Excellent oxidative stability

Incroslip SL is a fully saturated product with excellent oxidative stability. This means Incroslip SL will not degrade over time or after exposure to heat and UV light.

## High slip performance

With high slip performance comparable with erucamide at low addition levels, Incroslip SL makes polymer processing and handling easier. This is essential during manufacture to stop friction related problems such as difficulty with winding of film rolls and bag production.

## Key benefits

- High and long lasting slip performance
- Excellent organoleptics
- High oxidative stability
- Scratch and scuff protection
- Low visible bloom
- Low application and release torque
- Food contact compliance

## Incroflo range

In support of future innovation, Croda has announced a new line of specialty additives for wood plastic composites (WPC). To create these materials, plastic and wood need to be processed together quickly and efficiently. Incroflo™ specialty additives act as lubricants to allow increased throughput of WPC during processing by increasing flow rate and dispersion. This allows for lower processing temperatures and pressures during manufacture. In addition, the Incroflo range:

- Acts as a barrier between the WPC and the extruder to reduce wear, especially on screws
- Optimises mechanical performance as measured by MOR, MOE and Charpy impact resistance
- Improves surface finish
- Reduces water absorption, which can lead to warping



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## DUPONT

### Foundation

- 1802

### Turnover

- 35.7 billion \$ (2013)

### Employees

- Approx. 64,000 (2013)

### Branches

- Performance Polymers
- Industrial Biosciences
- Packaging & Industrial Polymers

### Key materials

- DuPont Bio-Sourced Material Solutions
- Bio-PDO™
- Sebacic acid

### Key bio-based products

- DuPont™ Sorona® renewably sourced fiber
- DuPont™ Bynel® renewably sourced tie-layers
- DuPont™ Fusabond® renewably sourced polymer modifiers
- DuPont™ Hytrel RS renewably sourced thermoplastic elastomer
- DuPont™ Zytel RS renewably sourced long chain nylons
- DuPont™ Sorona EP renewably sourced thermoplastic polymer



*The miracles of science™*

### Company

DuPont (NYSE: DD) has been bringing world-class science and engineering to the global marketplace in the form of innovative products, materials, and services since 1802. The company believes that by collaborating with customers, governments, NGOs, and thought leaders we can help find solutions to such global challenges as providing enough healthy food for people everywhere, decreasing dependence on fossil fuels, and protecting life and the environment. For additional information about DuPont and its commitment to inclusive innovation, please visit [www.dupont.com](http://www.dupont.com).

DuPont provides its customers with innovative science solutions for multiple industries, among which polymers for injection molding, extrusion and blow molding technologies as well as expert application development assistance to enhance the performance, reduce the total system cost and optimize the sustainability of their products. Key market segments include: automotive, material handling, healthcare, energy, electrical/electronic components, hand held devices, appliances, sporting goods, food, cosmetics, medical products, industrial packaging industries, carpeting & apparel and other consumer products.

### Products

#### Science meets Sustainability

DuPont has invested extensive scientific research and development to create next-generation bio-based polymers to help reduce the use of fossil fuels without reducing performance. By tapping innovative technology and strategic partnerships, DuPont has created novel methods of manufacturing high-performance materials from renewable resources. This new generation of materials, derived from biomass instead of petroleum, reduces the environmental footprint without compromising performance. The versatile offering includes several families of Sorona® renewably sourced fiber, Bynel® renewably sourced tie-layers, Fusabond® renewably sourced polymer modifiers, Hytrel® RS renewably sourced thermoplastic elastomer, Zytel® RS renewably sourced long chain nylon products and Sorona® EP renewably sourced thermoplastic polymer.

**Sorona® renewably sourced fiber** is one of the first high-performance fibers derived from rapidly renewable materials. Sorona® is a PTT or polytrimethyl terephthalate. Based on the unique performance benefits of PTT, the U.S. FTC awarded a new fiber generic classification to PTT – triexta. It offers exceptional durability and stain resistance as well as the ability to blend with and enhance the performance of other natural and man-made fibers. Sorona® is used in residential and commercial carpets, apparel and automotive mats and carpets.

A leading biopolymer, Sorona® contains 37 percent annually renewable plant-based ingredients. Even better is its environmental footprint. Producing Sorona® uses 30 percent less energy and releases 63 percent fewer greenhouse gas emissions compared to the production of nylon 6. Compared to nylon 6,6 Sorona® production uses 40 % less energy and reduces greenhouse gas emissions by 56 %.





*The miracles of science™*

Bynel® renewably-sourced coextrudable tie-resins and Fusabond® renewably-sourced polymer modifiers are produced using “I’m Green™” Green Polyethylene from Braskem. They are based on sugarcane ethanol and have more than 80 % renewable sourced carbon content. The products are designed to be drop-in replacements to the conventional alternatives and are either meeting or exceeding the performance of petroleum-derived products. Combined with DuPont know-how in design of multi-layer packaging structures and in formulation of polymer compounds, the materials are positioned to enable further penetration of bio-based polymers in more sophisticated structures.

Hytrel® RS renewably sourced thermoplastic polyester elastomer contains between 20 % and 60 % renewably sourced materials with all of the performance characteristics of traditional Hytrel®. Hytrel® RS thermoplastic elastomer bridges the gap between rubber and rigid plastics, and provides all of the performance characteristics of traditional Hytrel®, with reduced environmental impact because it is made using renewably sourced polyether glycols.

Zytel® RS renewably sourced long chain nylons, containing 63 % to 100 % renewably sourced content, comprises all products based on PA1010 and PA610, including their copolymers and their alloys with other polymers. The Zytel® RS product family is made with renewable content that comes from sebacic acid which is derived from castor oil. Castor oil is one of the most versatile, non-food competing natural products. Zytel® RS completes the range of typical flexible polyamides with additional advantages of superior chemical and hydrolysis resistance and very good temperature resistance.

Sorona® EP renewably sourced thermoplastic polymers are PTT polyesters with 20 % to 37 % renewably sourced materials (by weight). Sorona® EP thermoplastic polymers are PTT polyesters made with a renewably sourced propanediol (PDO) made from technical starch. Sorona® EP thermoplastic polymer starts with the basic Sorona® polymer chemistry and then uses a proprietary formulation technology to create high-performance engineering polymer resins.



Link to Agrobiobase



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## ENVIPLAST®

### Company

- Inter Aneka Lestari Kimia, PT

### Employees

- 550

### Production capacity

- 50,000 metric tons/annum

### Business units

- Building & Construction Chemicals
- Masterbatch & Polymer Compounds
- Biopolymer compounds

### Biopolymer compound products

- ENVIPLAST® Pellets
- ENVIPLAST® Bags

### ENVIPLAST® key features

- Made mainly from natural starch, vegetable oil derivatives and other natural abundant resources
- Contains no polyolefin plastic
- Harmless when consumed by animals
- Safe for plant growth
- Good oxygen barrier
- Good antistatic property
- Recyclable with paper



### Company

Inter Aneka Lestari Kimia, PT was founded in 1985 to manufacture building and construction related chemical products. To serve the growing plastic industries in the country, the masterbatch and polymer compound business unit was established in 1990. The Biopolymer compound business unit was set up in 2006.

### Product

ENVIPLAST® as a bio-based polymer compound is introduced to the market after extensive research and development for over 6 years. ENVIPLAST® offers alternative solutions to the issues by introducing bio-based polymer compound pellets and bags in 2011 to the market. ENVIPLAST® having a sustainable lifecycle, mostly go back to nature in the form of CO<sub>2</sub>, H<sub>2</sub>O and biomass.

ENVIPLAST® bags have a density of 1.27–1.32 g/cm<sup>3</sup>, will soften in water, are consumable by macro and micro-organism, thus causing low pollution both on land and in marine environment.



Shopping bag

ENVIPLAST® bags contain no polyolefin plastic. Its manufacturing process is similar to that of conventional PE bags, but the conventional PE blown film machines must be modified. Existing PE bags manufacturers can still continue operation with a low modification cost.

Internal observation has shown that ENVIPLAST® bags – when accidentally disposed in nature – are consumed by land and aquatic animals (snails, worms, crickets, crayfish, to name a few). It passed the animal safety study as referred to the Assessment of Acute Oral Toxicity by WIL Research, The Netherlands, based on OECD No.423 (2001), EC No.440/2008 B1, EPA OPPTS 870.1100 (2002), JMAFF (2011).

### ENVIPLAST® bags physical properties:

PROPERTY	UNIT	VALUE
Density	g/cm <sup>3</sup>	1.27–1.32
Melt Flow Index of pellets (170°C, 10 kg)	g/10 min	15–20
Tensile Strength	Mpa	8–14
Elongation	%	120–160



ENVIPLAST® pellets





### Immersion test of ENVIPLAST® bags:

MEDIA	CHANGE
Hot water $\geq 80^{\circ}\text{C}$	Dissolved
Water (ambient temperature)	Weakened
10 % HCl solution	Dissolved
20 % NaOH solution	Weakened
Vegetable oil	No visual change
Mineral oil	No visual change
Alcohol	No visual change
Aromatic solvent	No visual change
Hydrocarbon solvent	No visual change

ENVIPLAST® films also have electrostatic dissipative property, with a surface resistivity (ASTM D257) of  $10^{7.5}-10^{10}$  ohm/cm<sup>2</sup> compared to HDPE/LDPE at  $10^{13}$  ohm/cm<sup>2</sup>. Hence ENVIPLAST will not attract dust when it is used as wrapping material. It is also potential to be used as antistatic wrapping for electronic components, which are prone to interference caused by electrostatic.

Its good oxygen barrier (0,0235 mL/100in<sup>2</sup>.day, ASTM D3985, at 0 % Relative Humidity, 23 °C) makes ENVIPLAST® potential to be used as a protective layer in food and healthcare multi-layer flexible packaging. However this property is influenced by the level of the air humidity.



Cassava plant



Lifecycle

ENVIPLAST® bags can be recycled together with paper products.

ENVIPLAST® bags as substitute for conventional single use PE plastic bags, are potentially applicable for supermarkets, hotels, hospitals, department stores, as well as industrial wrapping, animal waste bags and for those, who wish to contribute to a greener environment.

### Potential applications:

- Shopping bag
- Garbage bag
- Laundry bag
- Disposable apron
- Electronic wrapping material
- Spare parts wrapping material (dry and lubricated)
- Multipurpose disposable packaging

ENVIPLAST® is continuously being developed to meet performance criteria in different applications.

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## EVONIK INDUSTRIES AG

### Turnover

- 12.9 billion €

### Employees

- 33,500

### Branches

- Specialty chemicals

### Key materials

- Polyamides
- Polyphthalamide
- Polyetheretherketone

### Key products

- VESTAMID® Terra –  
bio-based polyamides

### Other products

- TROGAMID®
- VESTAKEEP®



### Company

Evonik, the creative industrial group from Germany, is one of the world leaders in specialty chemicals. Evonik's bio-polyamides are often compounded with a variety of different additives ranging from reinforcement materials to stabilizing systems to meet the high demands of our customers.

Our business line High Performance Polymers is specialized in manufacturing customized products and systems. We have been producing high-performance plastics for over 40 years.

Evonik has recently added a group of bio-based polyamides to its VESTAMID® family. The polymers, sold under the VESTAMID® Terra brand name, are based on monomers produced partly or entirely from fatty acids. The most important source is currently castor oil, obtained from the seed of the castor oil plant, which is not used as food or animal feed, so its cultivation does not compete with that of food crops. Evonik is also forging ahead with the development of further polyamides from renewables based on palm kernel and rapeseed oils. One of the driving forces for the development of bio-based polymers at Evonik is the company's own demand for more resource efficiency and greater sustainability for the raw materials used.

In addition to polyamides based on renewable raw materials, Evonik has also been producing polyamide 12 and 612 compounds and polyamide 12 elastomers (PEBA) for about 40 years, and, more recently, polyphthalamide compounds all under the VESTAMID® brand name. Major manufacturers have been using all these materials for decades.







## Material

People assume that natural fibers automatically mean less convenience or worse performance. The natural fiber-reinforced VESTAMID® Terra proves that this is not the case. Reinforced with materials such as bamboo fibers, the bio-based polyamide molding compounds have outstanding mechanical and physical properties and are in no way inferior to other engineering plastics. Thanks to their lower carbon footprint than exclusively petroleum-based polyamides, VESTAMID® Terra products make a significant contribution toward conserving fossil fuels and reducing the greenhouse effect. This is something that has been confirmed by TÜV, Germany's Technical Inspection Association.

Demand for organic materials has increased significantly over the last few years, due to continuously rising prices of petrochemical raw materials and customer concerns regarding sustainable protection of resources. With VESTAMID® Terra we are respecting customers' wishes and offering a bio-based alternative for high quality polyamide components such as are used in sports equipment, electronics, and automotive construction.

## Products

Evonik currently offers three types of bio-based polyamides: VESTAMID® Terra DS is a 100 % bio-based polyamide 1010, VESTAMID® Terra HS is a 62 % bio-based polyamide 610, while Terra DD can be a 45 % or 100 % bio-based polyamide 1012 depending on the monomer source. Each type is available in several different viscosities as well as glass fiber-reinforced variants. Different natural fiber reinforced products are under development and can be supplied upon request. The DIN CERTCO organization for conformity assessment confirms the conformity of all VESTAMID® Terra grades.

VESTAMID® Terra molding compounds are semicrystalline and are thus distinguished by high mechanical strength and good resistance to chemicals and stress cracking. They also have high to very high heat deflection temperatures and a low absorption capacity for water, so that the good mechanical properties are retained even at high humidity. These compounds can be processed on all injection molding machines adapted for polyamide and are also suitable for filament production.

Bio-based polyamides can be used even for extreme applications. One polymer capable of particularly high performance is VESTAMID® HTplus a polyphthalamide (PPA) that permanently resists external temperatures over 180 °C. It is used, for example, as a charge air duct in turbochargers. In the Lotus Exige sports, for example, VESTAMID® HTplus reduced the weight of the charge air duct by half compared to the metal duct, and also improved the flow properties—saving fuel and minimizing CO<sub>2</sub> emissions.



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## FKUR KUNSTSTOFF GMBH

### Foundation

- 2003

### Branches

- Development, Production & Distribution of Bioplastics
- Biodegradable & compostable resins
- Bio-based resins

### Key materials

- Biobased and compostable resins for all processing methods and applications for your product of choice

### Compounding products

- Bio-Flex®
- Biograde®
- Fibrolon®
- Terralene®

### Distribution products

- Green PE (Bio-PE)
- Globio (Bio-PET)
- Vestamid® Terra (Bio-PA)



### Development – Production – Distribution

We follow our commitment with the slogan “Plastics – made by nature!”. As a leading producer of customized bioplastics we offer a broad range of biobased and compostable resins. Benefit from our variety of compounds as well as from our global distribution program. As the Bioplastic Specialist we provide innovative solutions for all processing methods and applications for your product of choice.

FKuR offers a broad portfolio of various extrusion and injection molding grades. Depending on the grade, FKuR products guarantee a long service life or are biodegradable and break down into naturally occurring, harmless base materials.

FKuR bioplastics are complete products which do not require any further modification. They can be processed on existing equipment as a drop-in-solution.

### Compounds made by FKuR

#### Bio-Flex® – full flexibility

Products for a variety of flexible applications

Bio-Flex® is a bioplastics family of products suitable for flexible applications, which can be converted using a wide variety of processing methods. All Bio-Flex® products are completely biodegradable and are based entirely or partially on natural raw materials.

The main applications for Bio-Flex® include a wide selection of flexible film applications, such as agricultural, household and hygiene films. Furthermore, it is possible to produce thermoformed articles and injection molded products using Bio-Flex®.

#### Biograde® – strong as wood

Products for a variety of rigid applications

Biograde® is a family of bioplastic products based on cellulose acetate for injection molding, sheet and profile extrusion. Cellulose, the base for the production of cellulose acetate, is the most easily accessible and renewable resource on the planet. Biograde® is predominantly a renewable and fully biodegradable material alternative for rigid applications.

The main applications for Biograde® are for a range of technical parts. As a result of its scratch-resistant and wear-resistant surface, it is also suitable for the production of highly stressed casings. The high heat resistance also meets the requirements for safety in use of the electronics and household articles industry.

#### Fibrolon® – perfect symbiosis between wood and plastics

Fibrolon® is a fantastic combination of plastic and wood, which are two very commonly used materials. The high surface quality and defined wood structure gives components made from Fibrolon® a unique charm and character. It looks like wood and feels like wood, but unlike wood itself, Fibrolon® can also be processed into complex structures and design elements.



Shopping bag – Bio-Flex®



Mouse & cups – Biograde®





### Terralene® – sugar cane at its finest

Terralene® is a tailor-made family of polyethylene compounds based on renewable raw materials. All Terralene® grades are based on sugar cane as a raw material thus making a valuable contribution to the conservation of fossil resources.

Due to the durability of Terralene® it is possible to produce products designed for a long service life. The material is processed on existing production equipment without any adjustments. After their use, Terralene® products can be integrated into existing polyethylene recycling streams.

### Broad Distribution Portfolio:

Following FKUR's philosophy "Plastics – made by nature!" and its commitment to sustainable raw materials, FKUR has been appointed as distribution partner for a variety of biobased plastics.

### Green PE (Bio-PE)

In comparison to conventional polyethylene, the main difference is that the ethanol used for Green PE is not produced using crude oil, but instead is derived from sugarcane. Therefore each ton of Green PE produced captures more than 2 tons of CO<sub>2</sub> thus helping to reduce harmful greenhouse gas emissions. The current product portfolio comprises of several HDPE, LDPE and LLDPE grades. These are particularly suitable for extrusion blow molding, injection molding and film extrusion.

### GLOBIO (Bio-PET)

Bio-PET contains up to 30 % renewable resources due to the use of bio-based MEG. The basis for this bio-based MEG is ethanol manufactured from Brazilian sugar cane rather than using ethanol produced from oil. GLOBIO is a 'drop-in' solution and is therefore able to replace conventional PET in a wide variety of applications. Typical applications for GLOBIO are bottles, films, automotive and other injection molding applications.

### VESTAMID® Terra (Bio-PA)

Produced by Evonik, VESTAMID® Terra is a new group of polyamides based on renewable raw materials. VESTAMID® Terra is manufactured from the castor bean (*Ricinus communis*) and its oil derivatives.

These Biopolyamides are long-lasting, durable high-performance polymers which can be used in a variety of technically demanding applications.

VESTAMID® Terra material is typically processed using injection molding and extruded to produce fibres and films. Currently there are three product lines available within this new group of polyamides:

- VESTAMID® Terra HS (PA610)
- VESTAMID® Terra DS (PA1010)
- VESTAMID® Terra DD (PA1012)

Our product solutions provide our customers with an opportunity to implement their individual sustainability goals. Please do not hesitate to contact us for further information.



Soap bottle – Green PE



Crate – Terralene®

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## ISOWOOD GMBH

### Foundation

- 1997

### Turnover

- 8 million €

### Employees

- 25

### Branches

- Automotive Industry

### Key materials

- Natural fibers and PP-fibers

### Key products

- Malleable non-woven mats



Since 1998 IsoWood is producing in Rudolstadt/Germany malleable mats made of natural and synthetic fibers. In that way we are supporting a sustainable economy. Primary market is the automotive supply industry and similarly sophisticated sectors. With these products IsoWood takes a leading position among the competition.

All natural fiber products are mainly made of Flax, Hemp or Kenaf, but the customers can choose other natural fibers like Abaca, Cotton, Coco, Sisal or other mixtures too. The natural fibers are combined with thermoplastic fibers and needled, sometimes, if it is necessary, a light weight fibrous web can be needle on top.

IsoWood currently has expanded the capabilities with a glass fiber/polypropylene production line. It completes our portfolio with new special products.

All these products are pressed by the customers with forming tools and laminated. The results are high class carrier materials for different applications like door panels, door inserts, boot side panels and others. We are running a laboratory too, where we can do all important tests on materials and components for ourselves.

This means IsoWood is a competent partner in product development to meet the specific demands of the special project.



Non-woven facility



Heating an molding press



Door panel made of natural fiber/PP



Natural fiber/PP-parts with thermal transfer printing

#### iSOWOOD performance parameters:

- Production area: 5,200 m<sup>2</sup>
- Maximum production capacity natural fiber mat: 1,000 kg/Bh

#### Specific product weights w/o interface:

- Natural fiber 800 g/m<sup>2</sup>–2,400 g/m<sup>2</sup>
- Produced width: 3,000 mm
- Maximum single format: width 2,200 mm/length 2,400 mm

#### ... or on demand as a stamping part

- Maximum stamping size: width 2,200 mm/length: 1,980 mm

#### Heating and Molding press:

- Pressure force: 150 t
- Maximum size: width 1,100 mm/length: 1,400 mm

#### Contact

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## JELU-WERK JOSEF EHRLER GMBH & CO. KG

### Foundation

- 1908

### Turnover

- 20 million €

### Employees

- 70

### Key products

- JELUPLAST® WPC granulates for industrial processing
- JELUXYL® Pure-grade wood fibres
- JELUCEL® Cellulose fibres and powders



Natural fibres. Simple and effective.

### Company

JELU-WERK has developed an efficient process for the production of homogeneous Wood Plastic Composites (WPC) from plastic, wood fibres and additives. We supply premixed compounds and also manufacture customised blends to order. We are a medium-sized company that has been managed by the Ehrler family for more than two generations.

### Our bioplastics

To produce our WPC granulates we compound plastics and wood fibres to create a homogeneous biocomposite. Our WPC is granulated, as processing granulates results in extremely homogeneous end products. The compounds have consistent running properties on the machine, facilitating a higher output. Compounding also increases the density of the biocomposite and improves its material properties, giving the end products greater strength and stiffness.

We only use our own wood fibres for our biocomposites, as these meet certain criteria, such as having a fixed grain size and being of the same type of wood. Thus we are able to reliably set the physical-mechanical properties of our biocomposites to specific values. By means of additives, the characteristics can be varied and adjusted to individual applications. Our biocomposites fulfil the German standards for use in foods and toys.

### Characteristics

Depending on the composition of the WPC granulates, the resulting products are suitable for outdoor or indoor use. WPC has already proven optimal performance in many applications because of its extraordinary properties:

- Mouldable like plastics
- Firm like wood
- Not electrically conductive
- Inexpensive like plastics (basic compound without additives)
- Fulfils all important standards for toys and foods
- Improves carbon footprint
- Reduces environmental impact due to plastics

### Ingredients

We offer compounds based on different ingredients. We process the following plastics:

- Polyethylene (PE) from mineral oil
- Polyethylene (PE) from sugar cane
- Polypropylene (PP)
- Thermoplastic starch (TPS)
- Polylactide (PLA)



Products made from JELU WPC granulate using the extrusion technique.



Profiles made from JELU WPC granulate using the coextrusion technique.





Other plastics are also suitable for making biocomposites. Please contact us if you are looking for a WPC that is based on another plastic material.

#### We use the following fibres:

- Wood fibres
- Cellulose fibres

All compounds can be modified by additives. We adjust the properties of the compound to specific applications in line with your requirements. Let us know what you want from your compound and we will tell you what is feasible.

#### Processing

We have developed our WPC granulates for use in industrial processing. The biocomposites are suitable for conventional plastics processing machines, and have a proven track record in injection moulding and extrusion. Our technicians have many years of experience and will be glad to help our customers with advice on processing WPC on their premises. We are happy to provide you with product samples and test rods. You can find data sheets with process parameters and measurement results on our website: [www.jeluplast.com](http://www.jeluplast.com). We can quickly determine the compound that is suitable for your application by talking to you. Please call us.

#### Pure biocompounds: 100 % natural

We have also developed a number of bioplastics that are manufactured using only renewable raw materials. Thus we offer a fully compostable biocomposite consisting of thermoplastic starch (TPS) and wood fibres. The compound meets the European standard for compostability (DIN EN 13432). We produce another compostable biocomposite from polylactides (PLA) and wood fibres. Products made from this compound can be recycled in composting plants. We also process polyethylene (PE) from sugar cane to produce WPC. Since PE from sugar cane has the same properties as PE from mineral oil, products made from this compound are weather- and moisture-resistant.

[www.jeluplast.com](http://www.jeluplast.com)

Here you will find further information, data sheets and process parameters. We look forward to your visit!



These two containers were manufactured from JELU WPC granulate using injection moulding.



These sprockets were also manufactured from JELU WPC granulate using injection moulding.

#### Contact

##### JELU-WERK

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## METABOLIC EXPLORER

### Foundation

- 1999
- Company listed on Euronext C

### Employees

- 74

### Feedstocks

- Crude glycerine
- Glucose, Sucrose
- Second generation sugars

### Key bio-based products

- L-METHIONINE
- MPG
- PDO



### Changing the way we produce

MEtabolic Explorer (METEX) is a green chemistry company founded in 1999 that develops innovative processes based on the principle of industrial-scale fermentation.

These processes consist in using non-pathogenic micro-organisms to produce intermediate chemicals that are used to manufacture products used in everyday life. This innovative technology is a genuine alternative to petrochemical-based manufacturing.

At the forefront of a new industrial sector focused on renewable and sustainable solutions, METEX intends to be one of the first entrants on a market that has global implications.

The company has set itself two major challenges: to help industrial firms find new ways of sourcing and producing and to meet consumer's environmentally responsible expectations.

### METEX competencies to provide industrial biotech solutions

Develop scientific innovation



The ability to identify & develop innovative pathways is a must-have to allow setting up competitive biotech processes. As a pioneer, METEX has a proven experience & has moved at early stage to integrate both strain & process development.

Value industrial renewable feedstocks



Renewable feedstocks are not standard products. METEX integrates quality, geographical & market variabilities into its development.

Prove industrial scale-up



Innovative processes need to be demonstrated at preindustrial scale. METEX has multipurpose and flexible equipments to design, validate process books and continuously optimize overall process economics.

Produce bio-based chemicals



Launching a new biochemical requires significant premarketing efforts, including sampling. Characterizing the different outputs of a biorefinery enables to identify by-product valuation opportunities.



## Products

The molecules produced by METEX innovative technologies are Drop-in solutions for the users, offering an equivalent or higher level of quality & performance compared to existing routes, out of competitive & sustainable processes.

### L-METHIONINE:



L-Methionine is mainly used as a feed additive for poultry & piglet. METEX has developed a performing technology and offers the only 100 % Bio-Methionine produced by a fermentation process from a renewable feedstock. METEX solution is a green alternative to support the expanding demand for amino-acids due to the growing consumption of meat worldwide.

### MPG:



Monopropylene Glycol (MPG) is traditionally derived from Propylene Oxide. METEX offers a fermentation process able to produce a high quality product. MPG is used into a wide range of applications for everyday goods, such as resins for the construction industry, detergents, de-icing, cosmetics & personal care goods, lubricants, paints & coatings.

### PDO:



METEX has developed an efficient production process enabling to produce PDO. This proven technology is offering an alternative route to a high quality product. METEX Bio-PDO is showing great features and offers the ability to produce high properties renewable fibers & carpets. TPU, Cosmetics & other specialty markets can also benefit from that bio-based performing diol.

### BUTYRIC ACID:



Butyric acid produced from METEX process is a 100 % bio-based solution for the feed market. This sustainable procurement route is also an alternative & competitive solution for the production of fragrances, other industrial applications or feed additives.

## Innovative processes supported by a strong IP portfolio

Since its inception in 1999, METEX has pursued an active policy to reinforce and protect innovation. METEX enjoys today a portfolio of 431 titles among 52 patent families.



Link to Agrobiobase



### Contact

**METabolic EXplorer**

ZAC Biopôle Clermont-Limagne

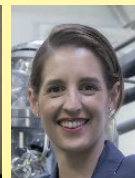
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France

Phone: +33 (0) 4 73 33 43 00

contact@metabolic-explorer.com

### Contact persons



Manuela Falempin

Sophie Macedo Galvaing





## METABOLIX, INC.

### Foundation

- 1992

### Employees

- 100

### Branches locations

- Cambridge, MA, USA
- Lowell, MA, USA
- Cologne, DE
- Metabolix Oilseeds, Saskatoon, SK, CAN

### Key products

- Mvera™ Compostable Resins
- Biobased Performance Additives
- PHA Latex
- Mirel™ Biodegradable Injection Molding and Thermoforming Resins
- Biobased Color Masterbatches
- Bio-composites (LFTs)



### About Metabolix

Metabolix, Inc. is an advanced biomaterials company that is well positioned to address growing market demand for sustainable solutions in the plastics, chemicals and energy industries. Metabolix develops innovative, biobased polymer solutions that enhance performance and add value for a wide range of industrial and consumer products, targeted to the markets for film and bag applications, performance additives and functional biodegradation. Our technology platform is based on industry leading polyhydroxyalkanoate (PHA) technology, which is our path to compostable bags, biodegradable packaging films, PHA latex coatings, and performance additives for plastics such as PVC and PLA.

Metabolix's PHA technology is also the foundation of our research into cost-effective production methods for biobased chemicals. Through our novel fermentation path, we can produce key chemicals in the C3 and C4 value chains, including BDO, GBL, THF, and acrylic acid.

Metabolix researchers are also engineering plants to make PHB and developing a platform for co-producing plastics, chemicals and energy from crops. Our work in crops highlights our leading edge capabilities and research targeting multi-gene expression and transformation of plants.



### Biopolymers

Metabolix delivers innovative biopolymer and performance additive solutions that address a wide range of real-world needs and market opportunities for plastics manufacturers and converters around the world.

Metabolix biopolymers are based on polyhydroxyalkanoate polymers (PHAs) produced through fermentation using renewable carbon based feedstocks. Metabolix has developed leading technology for production of a broad range of PHA biopolymers and proprietary polymer formulations as evidenced by an industry leading intellectual property portfolio and continues to innovate further to expand the range of performance and production economics of our PHA biopolymers.



### Film & Bags

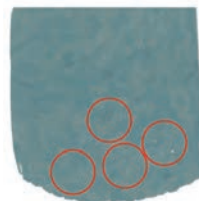
Metabolix biopolymers are a natural for bag and film applications where biodegradability is a high priority. Metabolix Mvera™ compostable resins provide brand owners and converters with unique materials combining performance with sustainability. We have developed resins that are optimized for industrial composting, enabling our customers to produce shopping bags, trash bags, leaf bags, and more.

### Performance Additives

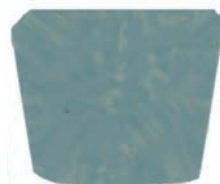
Metabolix performance additives significantly improve the mechanical and environmental performance of both traditional and biobased plastics such as PVC and PLA. We offer a range of PHA copolymers, from crystalline to amorphous, to accomplish excellent modification for many applications. We offer highly miscible additives for PVC to enhance impact modification, plasticization, UV stability, and improve processing. Additionally, our line of PCV additives can enhance scrap usage rate and upgrade value of recycle PVC. For PLA, we have developed immiscible additives that improve ductility, tear resistance, tactile feel, and biocontent without compromising clarity. We are developing PHA latex as an aqueous dispersion for paper and cardboard coatings, featuring high-barrier properties, biodegradability, and compatibility with composting and repulping.

### Functional Biodegradation

Our Mirel™ biopolymer is formulated to highlight the robust degradation profile of PHA polymers, and is uniquely suited to a range of applications – from agricultural and marine uses to medical applications to consumer products.



No i6003rp  
Holes show poor fusing and melting  
Poor surface quality



With i6003rp  
Compatibilization and melt homogenization  
Good surface quality and easy processing



### Contact

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### Contact person



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## MIFSUD S.L.

### Foundation

- The company dates back to the commercial activities of its founder, Mr Salvador Mifsud Andrés, relative to the marketing of cereal byproducts for stock feeding over fifty years ago (1957). The current company, MIFSUD S.L. was established in 1984

### Turnover

- 5 million €

### Employees

- 16

### Branches

- Plastic filling
- Natural fibers for industry
- Vegetable excipients
- Animal feeding

### Key materials

- Cereal byproducts

### Key products

- Rice husk flours in different grain sizes
- Commercial names: CAEX, CAES, CAMI, CAMIS, CACE, CAIMP



### Company

MIFSUD S.L. is a family company located in Tavernes de la Valldigna (Valencia, Spain); it has over fifty years of experience in the marketing of raw materials for the animal feeding area. Included in this activity, MIFSUD established a Department specialized in the collection, conversion and subsequent marketing of cereal byproducts, among which rice husk for vegetable excipients, natural fibers and plastic industries is most outstanding.



### Material

Due to our concern with improvement and innovation, MIFSUD specialized in the manufacture of micronized vegetable flour to be used as excipient in different areas such as veterinary and cosmetic, as well as plastic and chemical industries; after several different physical treatments, flours of high quality and excellent performance are obtained for each application. Through AIMPLAS (Tecnological Plastic Institute, in Valencia, Spain) MIFSUD has taken part, together with other companies, in the DOLFIN (Development of plastic structures) european project, in order to develop plastic structures reinforced with our vegetable flours. After several studies, results back up the use of our flours as filling in plastics, especially the so called wood plastic composite (WPC), due to the many advantages they offer as compared to other vegetable fillings, for example wood flour, mainly due to its physicochemical properties. The following advantages and qualities of the resultant plastics stand out:

- Great fireproofing, due to the fire-resistance of the flour.
- Good hydrophobic qualities. Its permanent contact with water is even possible, which is a very important characteristic considering that part of these materials remain exposed to elements; moisture does not affect them in the same measure as it does to other types of vegetable fillings.
- Excelent stress resistance and greater thermomechanic resistance than other kinds of vegetable fillings; good insulating properties.
- Possibility to provide very low moisture flours, between 2 % and 4 %, through an adequate thermic treatment; this is an interesting feature due to the impossibility of achieving flours from other sources with similar moistures.
- Low sintering tendency during plastic manufacture, which facilitates dosage; furthermore it has a lower influence on plastic viscosity than other vegetable fillings.







## Products

- CAEX, micronized rice husk.  
Moisture: 9–10 %. Grain size: 342–546 micron.
- CAES, dry micronized rice husk.  
Moisture: 2–4 %. Grain size: 342–546 micron.
- CAMI, micronized rice husk.  
Moisture: 9–10 %. Grain size: 114–342 micron.
- CAMIS, dry micronized rice husk.  
Moisture: 2–4 %. Grain size: 114–342 micron.
- CACE, micronized rice husk.  
Moisture: 9–10 %. Grain size: 50–114 micron.
- CAIMP, micronized rice husk.  
Moisture: 9–10 %. Grain size: < 50 micron.

## Contact

**MIFSUD S.L.**

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[www.naturalfibreforwoodplasticcompositewpc.com](http://www.naturalfibreforwoodplasticcompositewpc.com)

## Contact person



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## NATUREWORKS LLC

### Employees

■ 140

### Headquarters

■ Minnetonka, MN, USA

### Branches

■ in Netherlands, Belgium, Germany, Italy, Thailand and Japan



### Company

NatureWorks LLC is a company dedicated to meeting the world's needs today without compromising the earth's ability to meet the needs of tomorrow. NatureWorks LLC is the first company to offer a family of commercially available, low-carbon-footprint naturally advanced Ingeo™ lactides and biopolymers derived from renewable and abundant natural resources with performance and economics that compete with petroleum-based intermediates, plastics and fibers, and provide brand owners new cradle-to-cradle options after use of their products. NatureWorks is jointly owned by Thailand's largest chemical producer, PTT Global Chemical, and Cargill, an international producer and marketer of food, agricultural, financial, and industrial products and services. For more information about NatureWorks and Ingeo, visit [www.natureworkslc.com](http://www.natureworkslc.com).

**Innovative products made with Ingeo, an ingenious and naturally advanced material made from renewable and abundant natural resources.**



Nativia La Mia Ensalata utilizing Ingeo film



Electrolux s-bag® GREEN dust bags made from Ingeo fibers



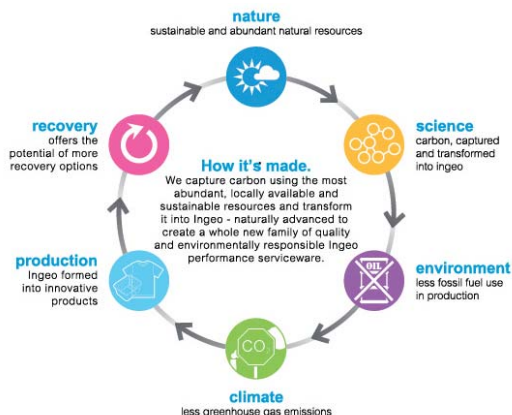
3Dom Ingeo-based filament used in 3D printing



Danone yogurt cups made from Ingeo plastic



## Ingeo Lifecycle



\*learn more about end-of-life options at [www.natureworkslc.com/eol](http://www.natureworkslc.com/eol)

## About Ingeo

Ingeo is the world's first performance material whose manufacture shows a significant reduction in greenhouse gas emissions. Made from naturally advanced materials, Ingeo is derived from renewable and abundant natural resources.

## How is Ingeo made?

Carbon is captured in these plant resources, sequestered from the atmosphere during plant photosynthesis and stored as plant starches. NatureWorks LLC uses dextrose derived from these starches as the starting point for Ingeo. Through a process of fermentation, separation and polymerization, the carbon and other elements in these natural sugars are transformed into the family of Ingeo grades captured in this resin guide.

## Where is Ingeo used?

Ingeo is used uniquely to create a full and diverse range of finished consumer goods marketed under the Ingeo brand. Bridging both plastics and fiber categories, Ingeo is fueling innovation and spearheading a whole raft of creativity across a wide range of products from packaging, foodservice, automotive, electronic, and durable goods, to personal care products, clothing, and homewares.

For more information about NatureWorks and Ingeo, visit:  
[www.natureworkslc.com](http://www.natureworkslc.com)

Twitter: [@natureworks](https://twitter.com/natureworks)

### Contact

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### Contact person

**Ady Jager**  
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[nw\\_europe@natureworkslc.com](mailto:nw_europe@natureworkslc.com)





## NOVAMONT S.P.A.

### Foundation

- Novamont is an industrial company headquartered in Novara (Italy), worldwide leader in the production of bioplastics starting from renewable materials.

### Seats

- Novara, Terni, Piana di Monte Verna

### Turnover

- Approx. 135 million € (2013)

### Employees

- About 280 (2013)

### Activities

- Development and production of new biodegradable products based on renewable raw materials

### Fields of application

- Farming, retail purchasing, disposable tableware, separate waste collection, industry (personal hygiene and cosmetics, automotive, packaging, animal accessories)

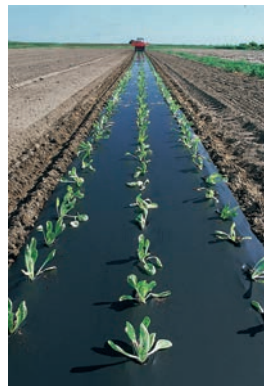
### Key bio-based products

- Mater-Bi®
- Origo-Bi®



### Chemistry at the Service of a System-Based Economy Company

Novamont is an industrial company whose roots lie in the Montedison School of Materials Science and which was set up in 1989 with a view to implementing the ambitious project of some research workers from the large industrial chemistry group: to integrate chemistry, agriculture and the environment. Ever since it was set up, Novamont has encouraged a new model of sustainable development and the transition from a product-based economy to a system-based economy, from a dissipative to a conservative approach to resources, through the use of renewable resources for the production of bioplastics for specific applications with a low environmental impact.



Mater-Bi®: agricultural applications

### Vision

The challenge for the future is to develop an innovative production and consumption model that conciliates social, economic and environmental sustainability to ensure the well-being of the next generations.

### Mission

"Living Chemistry for Quality of Life" Developing materials and bio-chemicals through the integration of chemistry and agriculture, by starting up third-generation biorefineries in the area and providing application solutions that ensure efficient use of resources throughout their entire life cycle, with advantages for the social, economic and environmental system.

### Products

Mater-Bi® is a family of innovative bioplastics based on plant components and biodegradable polymers totally or partially obtained from renewable resources. Under the trademark Mater-Bi® Novamont produces and sells various kinds ("grades") of biopolymers. The plant components are of various kinds and are all extracted from plantations that do not exploit virgin or deforested land. Vegetable oils used as a raw material for polymers come from non-genetically modified crops (no use is made of palm oil or soybean oil).

Origo-Bi® is a family of polyesters obtained from vegetable oils. They are intermediate products for the chemical industry used in the production of Mater-Bi® to improve its technical, economic and environmental characteristics.



Mater-Bi®: disposable tableware



### Properties and environmental profile of Mater-Bi®

The properties of Mater-Bi® grades vary considerably. As regards their mechanical properties, the products range from those with a low modulus and extremely high toughness to stiff products that tend to be brittle. As for their transparency, the products range from lactescent to transparent. All commercial grades may be transformed using blow moulding, casting, extrusion/thermoforming and injection moulding machines for traditional plastics. With regard to their biodegradability, the commercial products are all certified in accordance with the European and international standards by accredited Certifying Authorities that guarantee biodegradation in various disposal environments. Mater-Bi® waste may therefore be recovered through "biological recycling" together with kitchen and garden waste. Biodegradation in household compost and soil is also guaranteed for many grades.



The products and processes are constantly improved using the "Life Cycle Assessment" (LCA) approach. All grades of Mater-Bi® realize their full environmental potential when they are used in applications in which their peculiar performance brings advantages to the system both during their use and at the end of their life.

Our mission: living chemistry  
for quality of life

### Applications

Novamont concentrates its application development activities in fields in which its products can make a tangible contribution to the efficiency with which the resources are used. This principle is valid both for the field of biodegradable and compostable bioplastics and for that of durable bioplastics. In the former case, Novamont has developed applications in which biodegradability and compostability represent an added value (e.g. catering products "contaminated" with leftovers, which is unlikely to be

recycled or would be anti-economical to recycle) and/or serve a function (e.g. mulch films). An application that belongs to the latter category is the use of Mater-Bi® as a biofiller for tyres (as a partial replacement of carbon black and silicon), in which the fundamental aspect is what Mater-Bi® can do to minimize fuel consumption and CO<sub>2</sub> emissions in the transport sector.

The main fields of application of Mater-Bi® are: farming, retail purchasing, disposable tableware, separate waste collection, industry (personal hygiene and cosmetics, automotive, packaging, animal accessories).



Mater-Bi®: disposable  
tableware

### Contact

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### Contact person

Giulia Gregori

Strategic Planning & Corporate  
Communication Manager







## POLYVLIES FRANZ BEYER GMBH & CO. KG

### Foundation

- 1850

### Turnover

- About 60 million €

### Employees

- Over 400

### Branches

- Agriculture & Horticulture
- Automotive
- Building and Construction
- Consumer Goods
- Packaging

### Key materials

- Flax
- Hemp
- Kenaf
- Sisal
- Jute
- Wool
- Cotton

### Key bio-based products

- Naroplast®
- Narodur®



### “Nonwovens for innovations. Innovations for nonwovens.”

Polyvlies is an owner-managed medium-sized family company with over 400 employees.

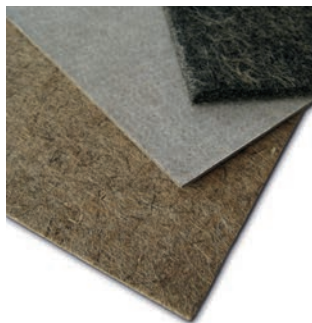
Polyvlies produces and finishes technical nonwovens made out of synthetic and/or natural fibres. Because of incorporating the most modern technology Polyvlies is capable of producing technical textiles with a maximum working width of 6 metres and weights from 80 to 4,000 g/m<sup>2</sup>.

The focus on customer orientation and joint application-specific developments has resulted in a range of more than 6,000 products that are produced from a number of different raw materials in an order-specific production procedure for various sectors (e.g. automotive, home textiles and geotextiles etc.)

### Materials

In addition to the use of a wide variety of synthetic fibres, per example polypropylene and polyester, a further focus is the processing of renewable raw materials. Based on our years of experience in this sector, the respective production processes are continuously modified and the production capacities consistently expanded. Of the 15,000 t of fibres that are turned into nonwovens every year at Polyvlies, 5,000 t are already natural fibres. These include flax, hemp and kenaf, but sisal, jute, wool and cotton are also still used.

The customer groups and applications for these natural fibre products are wide-ranging (e.g. construction, furniture, agricultural, automotive industries etc.) The preliminary products or semi-finished products for natural fibre reinforced plastic composites make up the lion's share here. Primarily, they are used for thermoplastic and thermosetting compression moulding in the automotive industry.





## Products

### Naroplast®

Naroplast® is a thermoplastic natural fibre plastic composite whose benefits, such as high strength and impact resistance combined with a low weight, come to the fore after compression moulding. This means that it is especially suited to ideally satisfy the strict requirements of the vehicle manufacturing industry. Compared to conventional materials, the symbiotic combination of renewable raw materials and synthetic polymers plays an important role in conserving natural resources, storing CO<sub>2</sub>, saving fuel, increasing passive safety and reducing noise levels. In addition, the matrix polymers can now also be replaced with low-emission materials without compromising performance.

### Narodur®

Narodur® is a thermosetting natural fibre plastic composite whose benefits, such as high strength and especially high stiffness combined with a relatively low weight, come to the fore after compression moulding. This means it is especially suited to ideally satisfy the very strict requirements made of carrier parts in the automotive, construction, shipbuilding or furniture industries. Here again, the symbiotic combination of renewable raw materials and synthetic polymers help to counter global warming, reduce noise emissions and contribute to passive safety. Depending on the application, customers have a choice of various matrix systems that can be supplied as pre-impregnated and ready for use in the pressing moulds.



### Contact

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## REVERDIA V.O.F.

### Foundation

- 2010

### Branches

- Agriculture market
- Industry
- Sport and footwear
- Automotive interior
- Non-woven and fiber

### Key materials

- Raw materials: starch, sugars
- Sustainable succinic acid

### Key bio-based products

Biosuccinium™

### Contact

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### Company

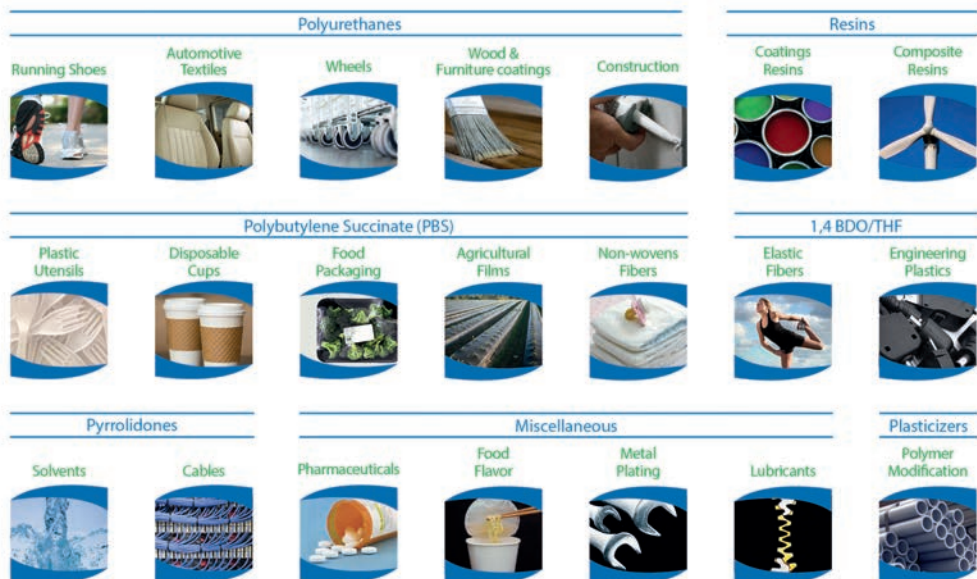
Reverdia is a joint venture between Royal DSM, the global Life Sciences and Materials Sciences company, and Roquette Frères, the global starch and starch-derivatives company. Reverdia is dedicated to be the global leader in the market for sustainable succinic acid, focusing on market development by establishing partnerships with direct and indirect customers, building on customer needs and Reverdia strengths.

Reverdia started operations of the world's first dedicated commercial-scale facility for the production of succinic acid from renewable resources in December 2012. The facility has a capacity of about 10 kt and is located on the Roquette site in Cassano Spinola, Italy. Reverdia has a global presence with the headquarter in the Netherlands, Europe.



### Biosuccinium™

Biosuccinium™ sustainable succinic acid is produced from renewable, plant-based resources which are converted via a unique low pH yeast process, a biotechnology process. Biosuccinium™ offers an alternative to chemicals such as fossil-based succinic acid and adipic acid. It allows customers to choose a bio-based alternative with an improved environmental footprint for a broad range of applications. Key applications include polybutylene succinate (PBS), polyester polyols for polyurethanes, coating and composite resins and (phthalate-free) plasticizers. End products include footwear, packaging and paints. See also the picture below.





[www.bio-based.eu/news](http://www.bio-based.eu/news)

# Bio-based News

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New Four-Year Scientific Analysis to Confirm Significant Damage to a Wide Range of Beneficial Invertebrate Species

**International Plastics Industry Efforts to Combat Marine Litter Up 90-Percent**  
Global fight against marine debris gains force

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Are the modern orthodoxies leading us in the wrong direction?

**The Bioplastics Industry in Korea – Where to Next?**  
Korea to invest US\$200 million into the bio-chemicals industry over the next 5 years

**Sweet Sweet Straw**  
The calorie free sweetener erythritol is widely used in Asia; it is also gaining popularity in Europe and America. At the Vienna University of Technology, a new cheap method has been developed to produce erythritol from straw with the help of mould fungi

**Süßes Stroh**  
Der kalorienfreie Süßstoff Erythritol ist in Asien sehr beliebt und gewinnt auch in Europa an Bedeutung. An der TU Wien wurde eine kostengünstige Methode entwickelt, ihn mit Hilfe eines Pilzes aus Stroh zu erzeugen

**Weltmarktführer: EU steigt zum größten Agrarlebensmittel-Exporteur auf**  
Die EU schlägt die USA aus dem Feld. Die europäischen Länder verzeichnen 2013 große Zuwächse bei der Ausfuhr von Agrarprodukten - und werden damit zum Weltmarktführer

25 June 2014

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NEWSLETTER

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Robert Gaudy Valencia  
The Future of the Chemical Industry by 2050

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**MIKROPLASTIK IN DER UMWELT**  
Quellen, Folgen und Lösungen

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## ROQUETTE

### Foundation

- Family-owned French group founded in 1933

### Turnover

- 3.1 billion €

### Employees

- More than 7,800 people worldwide

### Branches

- A world leader in starch industry

### Key materials

- Biobased raw materials: maize, wheat, potatoes, peas and microalgae

### Key products

- A range of more than 700 products
- For the plastic industry:
  - plant-based resins,
  - bio-based plasticizers
  - and bio-based building blocks



### Company

ROQUETTE, a French family Group with an international dimension, processes renewable raw materials: maize, wheat, potatoes, peas and microalgae. Among the 5 global leaders in the starch manufacturing industry, it offers its customers a wide range of products and solutions in the fields of human nutrition, pharmacy-cosmetology, paper-board, chemistry-bioindustry and animal nutrition. Present in over 100 countries, ROQUETTE has a turnover of 3.1 billion euros.

Its development, focused on nutrition-health and plant-based chemistry, is based on a strategy giving preference to the long-term, innovation and the commitment to achieve. Its mission: "Serve men and women by offering the best of nature".

### Material

Based on 80 years of expertise in starch transformation and the synthesis of its derivatives, ROQUETTE has conceived for converters and compounders, GAÏALEASE®, a sustainable range of plant-based resins.

GAÏALEASE® plant-based resins are thermoplastic products obtained by a patented process by grafting starch, giving them original properties.



Available GAÏALEASE® grades are suitable for:

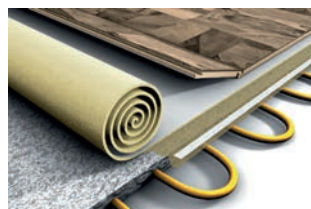
- Blow film extrusion,
- Extrusion foaming,
- Injection moulding,
- and Compounding.







Link to Agrobiobase



GAÏALEASE® plant-based resins designed for durable applications are:

- **Bio-based:** at least 50 % non GMO plant-based materials,
- **Performant:** drop-in solutions to substitute standard polyolefins with new additional properties (velvet soft touch, natural antistatic properties, easy coloring and compounding properties ...)
- **Sustainable** with certified environmental profiles: CO<sub>2</sub> emissions reduced by at least 65 % compared to polyolefins,
- **Processable** on existing lines, but at a lower temperature than traditional plastics (about 175 °C) inducing lower energy consumption,
- **Cost competitive:** bio-based alternatives to common polyolefins or more technical polymers, and
- **Recyclable** in existing polyolefins streams.

Typical applications of GAÏALEASE® resins are packaging (containers, pails, caps and closures, protective foams, shrink and wrap films, etc.), carrier and shopping bags, waste bags, household appliances, interior design ... Moreover GAÏALEASE® resins also fulfill heavy metals and REACH regulations and can be used for food packaging.

### R&D in Partnership with Customers

In its main Research and Development Center in Lestrem (France), ROQUETTE employs about 300 researchers and technicians and works alongside its customers in complete confidentiality to develop new solutions that meet their specific requirements.

This represents for them significant savings in terms of time and money, providing with GAÏALEASE® resins a competitive edge in their markets where consumers are increasingly demanding and sensitive to sustainable development in their everyday environment.



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## SONAE INDUSTRIA WOODFORCE

### Turnover

- 1 billion €

### Employees

- 5,500

### Branches

- 27 plants on five continents



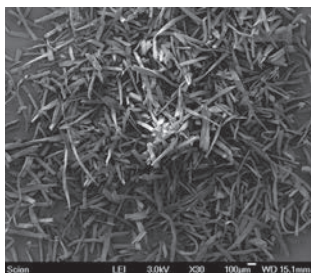
SONAE INDUSTRIA (Portugal) and SCION (New Zealand) have worked in a global partnership for several years in order to develop a new innovative and patented wood fibre technology. The concept was to develop an engineered MDF fiber dice (Wood Force) as the leading natural fiber reinforcement solution to replace glass fibre reinforced compound. A secondary market target is as a replacement for mineral fillers in weight reduction applications for composites.

The basic problem to be solved was to develop a mass produced & cost effective, easy and ready to use, reliable and consistent natural fibre technology for the injection moulding industry. The target was to successfully penetrate the large thermoplastic compound market in automotive, packaging, appliance, electronics and consumer markets by offering the same product worldwide to multinational OEMs.

The main aspects of this innovation:

- Using the well known MDF industrial process to mass produce refined softwood fibre,
- Replacing the thermoset resin content with dispersing chemistry,
- Dicing the resulting panel for easy gravimetric dosing in the process of thermoplastic extrusion,
- Achieving a significant reinforcement due to the ability to keep a high Length/Diameter ratio of the dispersed wood fibre after injection





WoodForce is a significant breakthrough in injection moulding as it delivers on 3 major requirements to succeed in today's complex industrial environment:

1. WoodForce delivers superior performance

- Superior Mechanical Properties
- Consistent Properties
- Enhanced Design (pigmentation possibilities)
- Weight Reduction (focus of the automotive industry)

2. WoodForce is industrially friendly

- Easy to use/Ready to use
- Favourable Health & Safety Profile (dust removal)
- Reduced Equipment Wear compared to glass fiber and minerals

3. WoodForce is environmentally fit

- Renewable and Sustainable raw material sourcing
- Great Carbon Footprint and great Life Cycle Analysis
- Recyclability and Favourable End of Life Options
- Lower energy used for conversion compared to minerals

The development of Woodforce brings significant benefits to the Forest Based Sector

- Forest products make a successful entry in new industrial applications
- WoodForce helps preserve existing MDF industrial assets (overcapacity issues);
- As a Forest product, it contributes to a more sustainable economy;
- WoodForce promotes the use of bio-plastics;
- It promotes the development of the recycled thermoplastics;
- WoodForce contributes to the growth of the Knowledge-Based Bio-Economy (KBBE)

Link to Agrobiobase



#### Contact

**Sonae Industria**

**Woodforce**

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[www.woodforce.com](http://www.woodforce.com)

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## STAEDTLER MARS GMBH & CO. KG

### Foundation

- 1835

### Employees

- 2,000

### Branches

- Writing, drawing, creative

### Key products

- Pens and pencils
- Oven hardening clay
- Writing instruments
- WOPEX®

### Other products

- Ink jet
- Styling clay



## INDUSTRIAL PRODUCTS

### Company

STAEDTLER is one the oldest industrial companies in Germany and is one of the world's leading manufacturer and supplier of stationary- and creative products. As an international company with a high export rate STAEDTLER has over 2,000 employees worldwide, thereof 1,300 in Germany. More than 75 % of the products are being manufactured in Germany. This means that STAEDTLER is Europe's largest producer of wooden pencils, erasers, fine-lead mines and modelling materials. STAEDTLER is proud of its long lasting tradition "Made in Germany".

### Development of WOPEX®

In the field of traditional pencil production graphite leads are covered with wood in more than 30 working steps, are decorated and exported in the whole world. While searching for new materials the idea emerged to reconsider the whole production process and to break with the traditional manufacturing.

The biggest challenge was to find a polymer analogue to wood. However, all commercially available materials had insufficient mechanical properties or could not be sharpened. The answer to this problem was the development of a new material by STAEDTLER R&D. The result was a WPC which combined the sharpening process on one hand, the mechanical firmness and necessary Young's modulus, on the other hand. It received the name WOPEX®. On the basis of WOPEX® all remaining pencil components like the writing leads and the lacquering were transferred into thermoplastic variations. Due to this the production of pencils and color pencils is possible in only one process, the co-extrusion. At the Paperworld 2009 the product was introduced into the market.

### Material

WOPEX® is an innovative wood-plastic-composite with a portion of 70 % wood which is being bond with a PE-polymer and wax. The wooden flour which is used comes from certified, sustainably managed forests (PEFC certificated) in Germany. WOPEX® has already been decorated with many national and international prizes and is one of the most important innovations of STAEDTLER.





# WOPEX®

## Characteristics

WOPEX® can even more! One of the most stable WPCs and at the same time very easy to work and carve by hand. The accuracy of contours of WOPEX® is within a tolerance of few 1/10 millimeters and the process with exceptionally high extruding speed.

In addition, conductible bars can be produced by additional additives. STAEDTLER uses this variation of the material for a special pencil which can be used on capacitive displays of smartphones and tablets.

	Eigenschaften properties	Prüfbedingung test specification	Norm standard	Einheit unit	WOPEX®-Industrial "Classic"
Allgemein general	Farbe color Füllstoffgehalt filler content				Helles Holz light coloured wood 70
Physikalisch physical	Dichte density		ISO 1183/A	g/cm <sup>3</sup>	~ 1.2
Mechanisch mechanical	Zug-E-Modul tensile modulus		ISO 527-2/1A/1	MPa	6510
	Zugfestigkeit tensile stress		ISO 527-2/1A/5	MPa	31.7
	Bruchdehnung strain at failure		ISO 527-2/1A/5	%	0.75
Thermisch thermal	VICAT- Erweichungstemperatur VICAT softening temp.	49N / 120 °C/h	ISO 306/B50	°C	93
	Wärmeformbeständigkeit heat deflection temp.	1.8 MPa	ISO75-2/Bf ISO75-2/A	°C	130
	Längenausdehnungs- koeffizient (linear, therm.) coefficient of linear thermal expansion	+23 °C / + 55 °C	ISO 11359-2	10 <sup>-5</sup> K <sup>-1</sup>	4.05
Brandverhalten flammability	UL 94 Einstufung flammability	S = 3.2 mm	UL 94	Class	HB
Sonstige other	Wasseraufnahme water absorption	Sättigung 23 °C	ISO 62	%	9.52
Anwendung processing					Extrusion



**DESIGN PLUS**  
**materialvision**

## Contact

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## TECNARO GMBH

### Foundation

- 1998

### Employees

- Approx. 30

### Branches

- Compounding
- Bio-based and biodegradable materials e.g. for toys, automotive, furniture, electronics, music instruments, packaging, office, building and construction industries as well as in funeral business, agriculture and forestry

### Key materials

- Lignin and lignin derivatives
- Polylactic acid, polyhydroxyalkanoates, starch, natural resins and waxes, cellulose and natural fibers

### Key bio-based products

- ARBOFORM®, ARBOFILL® and ARBOBLEND® – for moulded parts, semi-finished products, sheets (e.g. for thermoforming), films, profiles, etc.



### Company

Founded in 1998, TECNARO GmbH develops, produces and markets bio-based and biodegradable materials. The business is focused on three different material families: Liquid Wood ARBOFORM®, Wood Plastic Composites ARBOFILL® and Biopolymer Compound ARBOBLEND®.

Tecnaro received several awards for innovation, sustainability and in the category supplier: Green Brand 2013/14, Diesel Medal in gold 2011, European Inventor Award 2010, German Industry Award 2009, Werkbund label 2008, Innovation Award of VR Bank 2007, Golden Euromold Award 2000, etc. and contributed in numerous national and international research projects regarding material development based on natural resources.

Together with Fraunhofer, Tecnaro holds several patents in this field.



Green Brands  
Germany 2013/2014



Dieselmedaille 2011



European Inventor  
Award 2010

ARBOFORM®, ARBOBLEND® and ARBOFILL® can be processed by injection moulding, extrusion, calendaring, blow molding, thermoforming or pressing into moulded parts, semi-finished product, sheets, films or profiles.



"natureline" green roof system made from ARBOBLEND®.  
Picture: ZINCO



Sergio Rossi/Gucci Group: Eco Pump made from  
ARBOFORM®. Picture: Fabian Diehr





There is the option to mark and advertise your products with the established TECNARO inside-label. Please feel free to contact us!



Loudspeaker made from ARBOFORM®.  
Picture: Fraunhofer ICT



Romolo Stanco's Green Lamp made from ARBOFORM®.

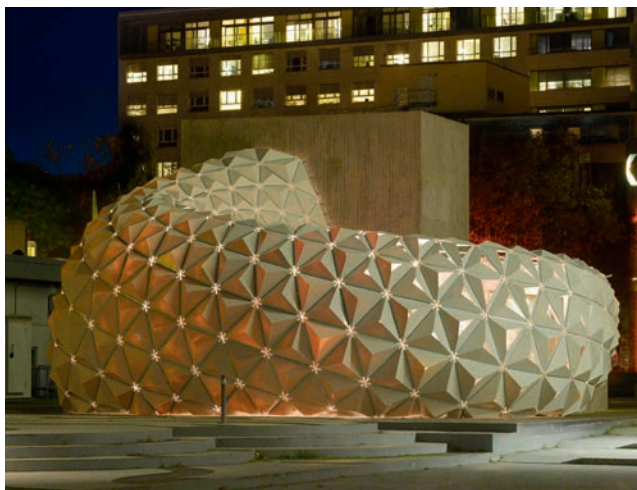


Storage box systems made from ARBOBLEND®. Picture: 4e solutions GmbH/ajaa!



Edding 24 highlighter made from ARBOFILL®. Picture: edding

Today's series applications can be found in toys, automotive, furniture, electronics, music instruments, packaging, office, building and construction industries as well as in funeral business, agriculture and forestry.



Bioplastics facade mock-up made from TECNARO material ARBOBLEND®.  
Picture: ITKE

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## UPM

### Company

- UPM has production plants in 16 countries and a global sales network

### Turnover

- 10 billion € (2013)

### Employees

- 21,000

### Branches

- Chemical pulp and paper production
- Development of new value-added uses of forest biomass, such as biofuels, biochemicals, biocomposites and fibril cellulose

### Key materials

- Cellulose blends for injection moulding and extrusion

### Key bio-based products

- UPM Formi – new cellulose fiber reinforced plastic composite
- UPM ProFi – wood plastic composite
- Paper
- Label materials
- Biofuels
- Biobased chemicals and additives
- Energy – renewable energy production
- Pulp
- Timber
- Plywood



The Biofore Company **UPM**

### Company

UPM is the Biofore Company whose production is primarily based on renewable raw materials that are biodegradable and recyclable. Over the past years, UPM has invested in the research and development of new value-added uses of forest biomass, such as biofuels, biochemicals, biocomposites and fibril cellulose.

In addition to paper, UPM is also one of the major chemical pulp producers. UPM's chemical pulp product range covers northern softwood and hardwood pulp as well as eucalyptus hardwood pulp. These fibres are strong and they can be reused or recycled several times. Chemical pulp is a natural Biofore product.

In 2011, UPM launched a new biocomposite, UPM Formi. The composite contains renewable cellulose fibres which reduce usage of oil based plastics. UPM's composite products are examples of UPM's innovative thinking and total lifecycle approach.

### Material

UPM Formi is designed for injection moulding and extrusion applications. Principal ingredients are specially selected cellulose fibres and virgin polypropylene. Cellulose fibres substantially increase stiffness and strength of polypropylene and allow wide variations in wall thicknesses. This brings new possibilities to injection moulding. Thanks to the vibration dampening properties of wood fibres, the material is well suited especially for demanding sound reproduction.

UPM Formi exhibits unique, tactile qualities with a natural, silky-smooth surface finish that provides a friendly and approachable feel to the material, as well as enhancing the overall emotional experience of the end user of the product.

UPM Formi granulates offer smooth and reliable processability. Due to high quality of pulp raw material, UPM Formi granulates enable clean and odourless composite products. A specially selected mixture of virgin plastic completes the mouldability of granulates for a wide range of end products with precise details. In addition, UPM Formi offers unlimited dyeing possibilities.

The share of renewable material can reach up to 60% thus the product is recyclable or it can be burned for energy at the end of its lifecycle. Moreover, UPM Formi's carbon footprint is significantly lower than traditional plastics'. Renewable fibre raw material is sourced via UPM's supply chain from sustainably managed forests.



## Products

UPM offers several grades for injection moulding and extrusion. UPM Formi GP for general use, UPM Formi SP for special surface, UPM Formi EFP for thin-walled applications and UPM Formi EXP for extrusion.

UPM Formi is suitable for manufacturing both consumer goods and industrial injection moulding and extrusion products. The new composite has extensive opportunities as the product range can vary from acoustics, electronic and automotive industries to furniture, tableware and other goods for everyday living.



Puustelli Miinus kitchen cabinet frame



Tregren herb garden



Genelec M-Series loudspeakers

### Contact

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### Contact person

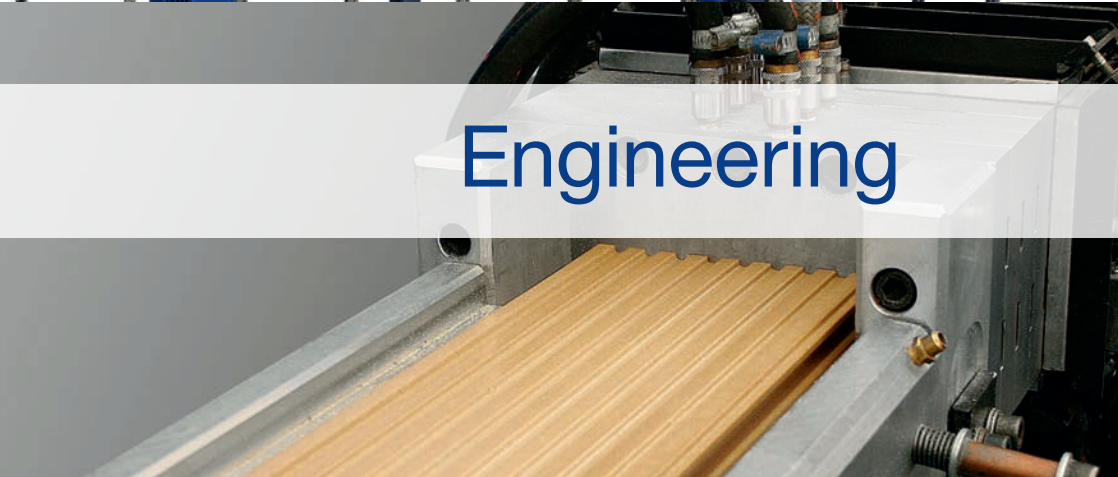
Harri Kosonen  
harri.kosonen@upm.com







# Engineering





## COPERION GMBH

### Compounding systems installed worldwide

■ 12,000

### Bulk materials handling systems installed worldwide

■ 8,000

### Employees worldwide

■ 2,500

### Network of locations worldwide

■ 40



confidence through partnership

### Integrated system solutions – unique process engineering know-how – global presence:

In Coperion, formerly Werner & Pfleiderer, you have a partner on hand to provide the optimum solution to every compounding task. This ranges from special applications on laboratory scale to industrial-scale production extruders. As pioneers in the development of the closely intermeshing, co-rotating twin screw extruder, we have unique expertise and experience in this field. Since the 1950s, Coperion has continued to set new standards in processing machinery and plant design for compounding technology. We plan and implement compounding systems for the plastics, chemicals and food industries which are designed precisely to our customers' applications. Over 12,000 compounding systems delivered all over the world are proof of our unique system and process competence.

### Processing of biobased and biodegradable products:

Processing of biobased and biodegradable products makes very high demands on the compounding process because of the variety of possible base polymers and the great differences in the formulation mixtures. Every process step in a processing plant must be designed to exactly meet the desired mechanical properties of the end product.

We have built up comprehensive know-how for the processing of biobased and biodegradable products. Our specialists benefit from our years of experience in the fields of cooking extrusion and plastics compounding which we gathered under our former name Werner & Pfleiderer.

Our twin screw extruders are the heart of the processing plants. The modular structure of the process section enables individual configuration to every application so that optimal product qualities are achieved. Apart from the extruder, we also provide the entire plant periphery from the raw material feeding to pelletizing and drying of the pellets. Alternatively, it is possible to produce biobased and biodegradable products by direct extrusion.

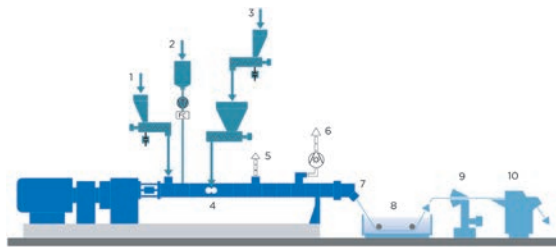


Compounding plant for the production  
of WPC wood plastic composites



Twin screw extruder ZSK Mc<sup>18</sup> with specific torque of 18 Nm/cm<sup>3</sup>





1 Starch / powder premix | 2 Plasticizer / liquid additives | 3 Polymer pellets | 4 Twin screw side-feeder ZS-B | 5 Atmospheric degassing | 6 Vacuum degassing | 7 Die head | 8 Water bath | 9 Airknife | 10 Strand pelletizer

Typical plant structure for the production of biobased and biodegradable products

## Typical applications for the processing of biodegradable products

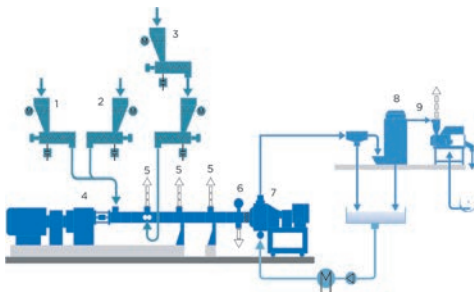
- Starch-based loose fill
- Thermoplastic starch
- Polylactide (PLA), PVOH, synthetic copolyester, PBS, PHA, PCL, CA
- Compounds of immiscible polymers/biomaterials
- Pelletizing of PLA, polymerization of PLA

## Processing of WPC wood plastic composites:

Our twin screw extruders have proven themselves successfully on the market for the production of WPC wood plastic composites for many years. As a long-standing partner to the wood fiber industry, Coperion is well-known for its extensive process and system know-how with every process step of the compounding plants adapted individually to the application: from filling and reinforcement to devolatilization. Coperion implements solutions for the production of WPC wood plastic composites which are custom designed for your individual application – from the laboratory twin screw extruder to the industrial production plant in modular design.

## Typical applications for the processing of wood plastic composites

- Filling and reinforcement with 40–70 % wood
- Filling and reinforcement with natural fibers such as flax, hemp, cellulose
- Compounding for injection molding applications
- Profile extrusion with WPC profiles



1 Polymer feeder | 2 Additive feeder | 3 Wood fiber feeder | 4 Twin screw extruder ZSK | 5 Degassing | 6 Start-up valve | 7 Pelletizing unit | 8 Dewatering | 9 Pellet drying

Typical plant structure for the production of WPC

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## HANS WEBER MASCHINENFABRIK GMBH

### Foundation

- 1922

### Employees

- Approx. 350

### Branches

- Machine building for the plastic processing industry and
- Sanding-machines for wood- and metal-surfaces

### Key materials

- All kinds of thermoplastic materials
- Wood polymer composites (WPC)

### Key products

- Single-screw-extruders
- Parallel twin-screw-extruders
- Conical twin-screw-extruders
- Extrusion lines for pipes and profiles



### Company

The family business WEBER was already established in 1922 and today it is led by the third generation. At the beginning gearboxes, especially continuously variable ones, as well as grinding/sanding machines were manufactured and sold with success. For more than five centuries extrusion lines have been developed and produced at WEBER that are successfully used for production of pipes and profiles. Numerous patents for equipments relevant in processing and especially for gearboxes are now standard in extrusion. WEBER takes the statement "Made in Germany" a step further and manufactures its extruders and their components (except electronics) in the Upper Franconian city of Kronach. Therefore an extremely high availability of spare parts, especially for older machines, is guaranteed.

Since the WPC-Extrusion has been taken on again in Europe in the middle of the 1990s, WEBER is significantly involved in the development of line concepts to extrude profiles of WPC. It was possible to come back to experiences of former decades. As WEBER Extruders were already used for production of wood fiber filled PVC profiles after the "oil crisis" of the 1970s.

Due to the nearly free formability of the material WPC during the extrusion process there are many application possibilities for the different products. WPC is mainly used for terrace boards and other profiles similar to wood. These new materials are also excellently suitable for inside decoration profiles and furniture as here the advantages specific for this material can be used optimally.

Today the applied extrusion processes to produce profiles of WPC are divided as follows:

**Direct Extrusion, or the single-stage process**, in which the several recipe components as shavings, plastics etc. are added separately on the extruder and out of that final products are produced directly

#### Processing of compound, the two-stage process.

In a first step a compound is made of the several components that then is processed to a final profile in a further extrusion process. Due to the higher productivity as well as the better reproducibility this process is getting more and more accepted in practice.

So a wide range of special twin screw extruders has been developed during the last years that are permanently adapted to the latest state of the art. The results of this are for example a special wear protection of the processing unit with layer thicknesses of several millimeters as well as an optimized venting unit. Parallel as well as conical twin screw extruders with an output of up to 1,000 kg/h are used. The recent developments of WEBER in the area of WPC-Extrusion are:



WEBER Twin Srew Extruder DS 9 FE



Special high performance screws with special design (patent pending) for better homogenization and dispersion of natural fibres. This enables to reduce the wear-ratios of machines. In combination with optimized materials for barrels and screws the lifetime of processing units is significantly extended.

The complete profile downstream line was optimized for the requirements of WPC-Extrusion. WEBER designed a special cutter with which besides cutting also the desired surface treatment 'brushing' inline is possible in one working step. The respective calibration table was optimally adapted to the tooling also obtainable at WEBER.

Optionally vacuum-pumps with frequency-controlled drives are available to reduce the power consumption as well as the emission of noise. The toolings are chosen along the wishes and applications of the customers from well-named die makers in Europe. So WEBER is also engaged to supply efficient and sustainable extrusion lines for the production of modern life-style products.

By this reasonably priced and compact downstream lines that can be combined with different WEBER Extruders without any interface problems are available for the customer.

For high-end applications which demand for surface treatment "sanding" the necessary machines for finishing the profiles are disposal out of the same house. WEBER is the only supplier of extrusion lines worldwide who is capable to supply production and surface-treatment from one single source.



WEBER PS-FE Haul-off Unit

With this WEBER created the necessary qualifications for the respectively optimum system solution. A team of experienced processing engineers accompany and advice the customer already starting with the idea of the product. In a large and modern laboratory the individual components are available in order to work out the optimum solution during trials made together.

WEBER can offer the complete system solution from one source for the different ideas in the area of producing profiles which is perfectly made for the requirements of the customer. Everything from one source, everything in proverbial WEBER quality, everything „Made in Germany“ and everything with the legendary WEBER service.



WEBER PS-FE Saw Unit



WEBER PS-FE Brushing Unit

#### Contact

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## HF MIXING GROUP

### Employees

- >1000

### Branches

- Mixing room equipment for rubber and plastic applications

### Key products/services

- Discontinuous internal mixers
- Continuous mixers
- Dump extruders
- Special machines
- Automation systems
- Complete mixing plants
- Customised Engineering
- Technical centre for mixing trials, recipe and process development



## MIXING GROUP

### Company

Since early 2010, the companies Harburg-Freudenberger, Farrel, Pomini Rubber & Plastics and Farrel Pomini Continuous Compounding Systems are operating together as HF MIXING GROUP. Each company offers both a long tradition and special strengths in building machines for the plastics and rubber industry. The HF MIXING GROUP uses its technical expertise to develop compounding facilities and systems while taking into account increasingly stringent safety and efficiency requirements.

In recent years, there has been a clear development towards more intense specialization with more complex recipes for the processing of plastics. Today the HF MIXING GROUP can offer both innovative discontinuous compounding facility solutions based on internal mixer technology for wood plastic composites (WPC) and natural fibre-reinforced plastics (NF-Ps) as well as continuous mixers especially for highly filled plastics.

### Products

The HF MIXING GROUP offers the complete range starting from single machines up to compounding plant solutions automated by HF's ADVISE System. Compounding lines based on internal mixer technology with discontinuous operation show their strengths especially well in the fields of natural fibre-reinforced plastics. This can be particularly seen in the process variables such as residence time, rotation speed or tempering, all of which can be adjusted independently, unlike when continuous mixers are used.

This allows processes to be optimised for different material requirements quickly and easily. The internal mixer technology is capable of incorporating high contents of fillers (e.g. wood flour) and reinforcing fibres like technical wood fibres, flax, bamboo, kenaf, jute, hemp, cellulose etc. into various matrix materials resulting in 'ready-to-use' pellets for injection moulding or extrusion processes. Typical matrix materials to be processed are polyethylene (PE), polypropylene (PP), polyvinylchloride (PVC), but also bio-based and biodegradable plastics.

As an experienced technology partner, we have thereby set new performance benchmarks in this market segment.

### More features of internal mixer technology:

- Direct feeding of fibres without costly pre-handling like cutting or pelletizing
- No pre-drying of raw materials required – even with moisture content far above 20 %
- High filler and reinforcing fibre contents are easily processable
- No thermal damage of temperature sensitive raw materials thanks to modern process controller
- Much lower moisture absorbance of the end product
- Significantly better material properties
- High degree of system flexibility and optimal process adaptability

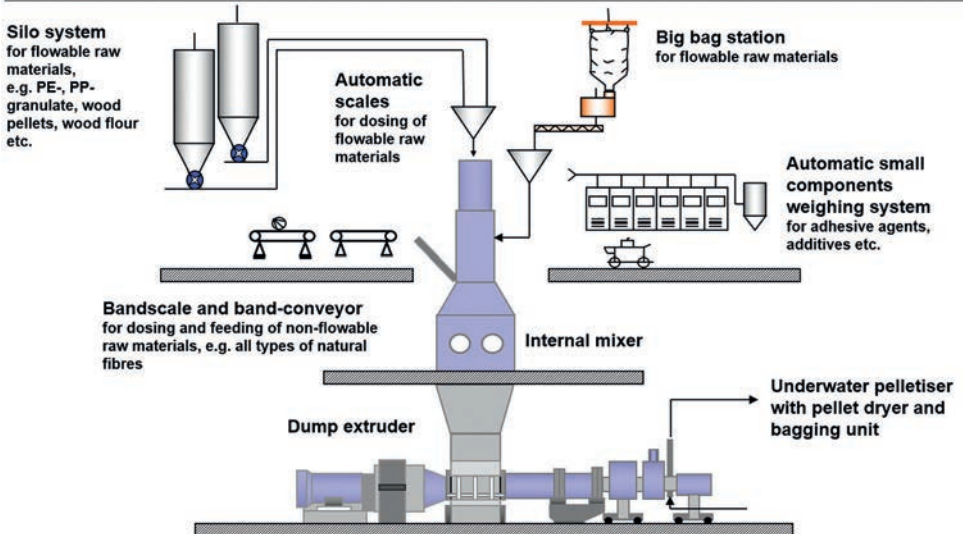


Internal mixer



## MIXING GROUP

### ADVISE CS and ADVISE ES



Plant solution for production of WPC and natural fibre reinforced plastic (NF-P)

### Recycling – Internal Mixer Technology closes the loop

Sustainability and recyclability are indispensable for reaching ecological goals and the recycling of thermoplastics in particular is gaining in importance. The large feeding door of the internal mixer allows adding of large-volume plastic components directly to the recycling process without being shredded first. This method allows the production of plastic pellets from 100% recycled materials, polymer blends as well as WPC and NF-P pellets with varying proportions of recycled materials without any difficulty.

### HF's Technical Centre – Experience mixing performance

All statements are based on intensive research and development work in our world-wide established technical centre in Freudenberg. Equipped with state-of-the-art mixing room technology we offer the opportunity to carry out mixing trials from laboratory to production scale.

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#### Contact person



Dipl.-Ing. Karsten Fischer  
Manager Business Development  
NF-P Mixing Lines  
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## REIFENHÄUSER EXTRUSION GMBH & CO. KG

### Foundation

- 1911

### Turnover

- 450 million €

### Employees

- Approx. 1,200

### Branches

- Machine building for the plastic processing industry

### Key materials

- All kinds of plastics
- Wood Polymer Composites (WPC)
- Biopolymers

### Key products

- Extrusion lines
- Compounding lines
- Twin Screw Extruders
- Single Screw Extruders



## Reifenhäuser

EXTRUSION TECHNOLOGY

### The Company

#### Innovative force as a motor for success

Constant research and development of Reifenhäuser EXTRUSION's line concepts are the focus of the leading manufacturer of high performance extrusion systems. The resulting innovations ensure the company's competitive edge worldwide. The use of new raw materials, in particular, and the associated changes in process technology require ever new solutions.

The benefit of its customers is always given the highest priority in all actions and considerations of Reifenhäuser EXTRUSION. Competitive advantages are generated from its employees' creativity, from superior and economically efficient technology, from speediness and convincing customer service.

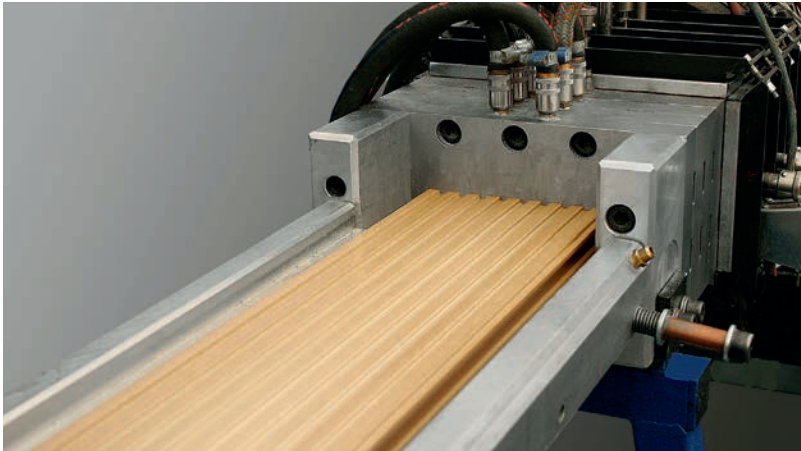
The comprehensive portfolio includes extrusion lines for thermoforming sheet, cast film and WPC in addition to extruders and components. Future-oriented products, market-driven strategies and direct relationship with customers are ideal prerequisites that allow rapid and direct response to changes in the marketplaces.

### Products

Since many years, Reifenhäuser began to focus on the extrusion of wood fibre reinforced plastics. Depending on the requirements, different types of extruder-systems are used.



Direct-Extrusion BiTrudex 115 II.



The basic component of Reifenhäuser WPC production lines are “Bitruder” twin-screw extruders. Available in market-conforming sizes from 65 to 135 mm screw diameter and provided with parallel, counter-rotating intermeshing screws they offer ideal prerequisites for the processing of wood fibers and thermoplastic materials such as PE, PP and PVC.

Beside compound extrusion, Reifenhäuser is increasingly placing the future-oriented, flexible direct extrusion process. This technology combines mixing, melting and direct processing of the individual components into the final product (profiles, pellets) in a single operation.

The latest developments in direct extrusion enable higher extrusion capacities than common compound extrusion systems. The “Bitrudex” direct extrusion technology is the basis of such an efficient WPC production-process. Key components are a single-screw extruder and a counter-rotating twin-screw extruder combined to form a cascadelike assembly. This design enables fibres to be processed with about 10 % humidity at speeds at a broad recipe variation. Up to 80 % wood are extruded at high output rates. In addition, this process allows the production of high-strength, UV-stable WPC profiles with PMMA as polymer matrix. The Bitrudex-system itself requires less space and has lower energy consumption than comparable compound extrusion system.

The WPC-portfolio includes an in house tooling-design, broad research and development experience, a lab-line for trials as well as world-wideservice.

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#### Contact person



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# Agencies Associations Clusters Councils





## ASSOBIOTEC

- ASSOBIOTEC represent the interests of our Associates at national and regional level

### Contact

#### ASSOBIOTEC

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FEDERCHIMICA

**ASSOBIOTEC**

Italian Association for the Development of Biotechnology

Set up in October 1986 within the Italian Federation of the Chemical Industry (Federchimica), Assobiotech is the Italian Association for the Development of Biotechnology, representing companies and science & technology parks operating in Italy and involved in various biotech-related fields – pharmaceuticals, diagnostics, agro-food, fine chemicals, environment, processing industry and equipment. They include emerging biotech companies and small to medium enterprises, as well as the biotech divisions of large organisations.

Assobiotech is co-founder member of EuropaBio, the European Association for Bioindustries, created in 1996.

Assobiotech provides entrepreneurial support to Italian and EU biotech developments and is the landmark for Italian companies involved in production and marketing of products derived from biotech applications.

### Assobiotech focuses its main attention on:

- Regulatory issues affecting production, marketing and use of biotechnology products and their standards harmonisation;
- Fiscal and financial policies aimed at motivating industrial innovation;
- R&D, education and training projects and programmes.

### Assobiotech's policy is mainly dealing with:

- Monitoring legislation in the regulatory area;
- Representing Italian bioindustry at National and international level;
- Providing a regular forum for the exchange of information and initiatives of entrepreneurial relevance;
- Taking active part to the reviewing process concerning the rules on industrial property.

### Assobiotech's activities include:

- Close interaction with National and international trade organisations dealing with biotechnology;
- Regular contacts with Universities, fostering collaboration between academia and industry in research and education;
- Information services on commercial biotech applications, on patents and on R&D programmes implementation.





BELGIAN BIOPACKAGING

## Association

The Belgian BioPackaging association was founded in 2006 and was the result of initiatives taken by companies involved in the production or use of compostable packaging made from renewable resources.

## Services

The main target of the association was and still is to get the green waste bin open for certified compostable packaging and disposables.

Although not yet realised, the Belgian BioPackaging association obtained with targeted lobbying work some important modifications to the local waste legislation and supported the creation of the first law (royal decree) in Europe that defines the terms “compostable”, “home compostable” and “degradable in the soil”. This same law prohibits the use of the term “biodegradable” on the packaging.



Where the end-of-life of the products was our first focus, we now decided also to give more attention to the organic origine of the raw materials, the renewability of the basic material.

The Belgian BioPackaging association is a platform for its members to share information and exchange news on bio-packaging and/or other compostable products made from renewable materials (and not only bio-plastics).



## BELGIAN BIOPACKAGING VZW / ASBL

### Foundation

- 2006

### Branches

- End-of-life options
- Information and news exchange on bio-packaging and/or other compostable products made from renewable materials

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### Contact person



Dirk Wens





## BIOTECHNOLOGY INDUSTRY ORGANISATION (BIO)

### Members

- 1,100 worldwide

### Contact

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### Contact person

Katharine MacPherson



**Biotechnology  
Industry  
Organization**

The Biotechnology Industry Organization (BIO) is the world's largest biotechnology trade association. We provide advocacy, business development, and communications services for more than 1,100 members worldwide. We promote the use of industrial enzymes, conversion of biomass to energy and chemicals, and innovative clean up technologies.

BIO hosts the World Congress on Industrial Biotechnology which is the world's largest and most significant industrial biotechnology event for business leaders, high-profile scientists, investors and policy makers in biofuels, biobased products, and renewable chemicals. The World Congress on Industrial Biotechnology will take place July 19–22, 2014 in Montreal.  
[www.bio.org/worldcongress](http://www.bio.org/worldcongress)

BIO also hosts the Pacific Rim Summit on Industrial Biotechnology and Bioenergy, which is the original conference dedicated solely to the growth of the industrial biotechnology and bioenergy sectors in the Asia-Pacific region. This year's event will be held in December 7–9, 2014 in San Diego.  
[www.bio.org/pacrim](http://www.bio.org/pacrim)



**Pacific Rim Summit  
on Industrial Biotechnology  
and Bioenergy  
December 7-9, 2014  
San Diego, California**

### List of Members (as of March 31, 2014)

Abengoa Bioenergy	Genomatica, Inc.	Poet, LLC
Agri-Energy	Gevo, Inc.	POET-DSM Advanced
Agrivida, Inc.	GranBio	Biofuels, LLC
Allylix, Inc.	Granbio Investimentos SA	Praj Matrix – The Innovation
Arborgen, Inc.	Green Biologics	Center
Arzeda	Heliae	Proteon BV
BASF Corporation	INEOS Bio	Proterro, Inc.
Bayer Corporation	Infinite Enzymes	Provivi, Inc.
Benson Hill Biosystems, Inc.	Itaconix Corporation	REG Life Sciences, LLC
BioAmber Inc	Joule Unlimited, Inc.	Reluceo Holdings, LLC
BioResource International, Inc.	Linnaeus Plant Sciences, Inc.	Renmatix
Braemar Energy Ventures	LiveFuels, Inc.	Rennovia, Inc.
Calysta Energy	Manus Biosynthesis	Reverdia
Cellana, LLC	Matrix Genetics	Rivertop Renewables, Inc.
ChemDiv, Inc.	MBI International	Segetis, Inc.
Cluster Industrial Biotech E.V. (CLIB2021)	Mercurius Biofuels	Senomyx, Inc.
Cobalt Technologies	Modular Genetics	Sinoven Biopolymers, Inc.
Coskata, Inc.	Mendel Biotechnology, Inc.	Sirrus
DNA 2.0	Metabolix, Inc.	Solazyme, Inc.
DSM	Monsanto Company	Succinity GmbH
DuPont Corporation	Myriant Corporation	Sweetwater Energy
Dyadic International, Inc.	NatureWorks, LLC	Synthetic Genomics, Inc.
Elevance Renewable	NexSteppe	Tate & Lyle
Sciences, Inc.	Neol Biosolutions	The Coca-Cola Company
Epygen Labs FZ, LLC	Novozymes	The Dow Chemical Company
Evolva, Inc.	OPX Biotechnologies, Inc.	Verdezyne, Inc.
Forelight, LLC	Phytion Corporation	Virent, Inc.
Lignol Innovations Inc.	Plastid AS	Yulex Corporation
	Plum Creek	Zepton Corporation



# 8<sup>th</sup> International Conference on Bio-based Materials

13–15 April 2015, Maternushaus, Cologne, Germany

The “**International Conference on Bio-based Materials**” provides major players from the bio-based chemical, plastic and composite industries with an opportunity to present and discuss their latest developments and strategies.

It is one of the biggest conferences worldwide: **160 participants** from more than **20 countries** came together at the “7<sup>th</sup> International Conference on Bio-based Materials”.

## Bio-based Material of the Year 2014

Awarded at the 7<sup>th</sup> International Conference on Bio-based Materials 2014 in Cologne, Germany.



Pictures: Qmilk, fischer, Hemp Eco Systems, ZinCo

### Contact



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Program & Innovation Award  
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## Venue & Accommodation

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Kardinal-Frings-Str. 1–3  
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[info@maternushaus.de](mailto:info@maternushaus.de)

## Organiser



[www.nova-institute.eu](http://www.nova-institute.eu)





## CLIB2021

### Foundation

- 2007

### Employees

- 8

### Branches

- Bioeconomy value chains in international chemical and energy markets

### Network

- 100 members from industry, academia, investors and infrastructure, 35 % international share

### Contact

#### CLIB2021

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CLIB2021 is an “Open Innovation Cluster” for bioeconomy with focus on industrial biotechnology. Our 100 cluster members recruit from academia, finance, industry, and SME, with an international share of about 35 %. The CLIB Graduate Cluster ensures qualification of young scientists in key areas of industrial biotechnology. The same scientific areas are also addressed by our Technology Cluster.

We help our members and partners to network along bioeconomy value chains in the chemical and energy markets. Identification of unusual value chains within the bioeconomy is a major task of our cluster. We reveal joint interests of stakeholders, moderate a targeted partnering, and create implementation plans including funding scenarios. However, the partners themselves are in charge of implementation and commercialization. Within the European Union as well as in its international networks our cluster serves as initiator, coordinator, and multiplicator to push the bioeconomy.

### Bioeconomy

CLIB mainly focuses on industrial biotechnology for chemical industry and energy markets: raw materials, biocatalysts, processes, products and technologies that result in monomers, fine chemicals or in their functionalization.

We employ a broad definition of industrial biotechnology, which also includes the biotechnological production of pharmaceutical building blocks or biologics. In recent years, the bioeconomy has been starting to increasingly address bulk chemicals and biofuels, topics which we have been taken up at CLIB as well. Pertinent project areas are identified by the CLIB team in conjunction with members in an iterative process.

### CLIB-Graduate Cluster

The CLIB-GC is one of the largest structured doctoral programs in Europe and offers unique interdisciplinary training at the interface between academic and industrial research in biotechnology with a total funding of 12 million Euros and over 120 doctoral students. Towards the end of the initial funding period from 2009–2012, the CLIB-GC underwent an external, international evaluation which gave very positive feedback. Funding by the Ministry of Innovation, Science and Research of the German State of North Rhine-Westphalia and the three universities has now been extended for further three years. In the second funding period the focus will be on the role of biotechnology as a central and pioneering research area in the bioeconomy.





# Club Bio-plastiques

Association Française pour le Développement des Bioplastiques

## Association

The Club Bio-plastiques is the branch association representing the entire value chain of the bioplastics' industry, from renewable raw materials to end of life. It supports the interests of its members regarding the promotion and development of bio-based plastics.

The association is actively involved at the european level.

## Services

To support the interests of its members regarding promotion and development of bioplastics.

To insure bioplastics technical knowledge thanks to its members' expertise. To help building a new environmental friendly business development through its network representation.



## CLUB BIO-PLASTIQUES

### Foundation

- 2007

### Employees

- 1

### Branches

- Bio-based plastics
- Biodegradable and compostable plastics
- Packaging
- Mulching
- Composting
- End-of-life options
- LCA

### Key products/services

- Club Bio-plastiques supports its members' interests regarding promotion and development of bioplastics.

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### Contact person



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## DECHEMA E.V.

### Foundation

- 1926

### Members

- Approx. 5,900

### Branches

- Chemical Industry
- Process Industry
- Bio-based Industry
- Biotechnology

### Key products/services

- > 50 events per year
- C. 100 topical working groups
- Position papers
- Continuous education
- Coordination of funding projects

### Contact

#### DECHEMA e.V.

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# DECHEMA

Gesellschaft für Chemische Technik  
und Biotechnologie e.V.

DECHEMA Gesellschaft für Chemische Technik und Biotechnologie e.V. (Society for Chemical Engineering and Biotechnology) brings together experts from a wide range of disciplines, institutions and generations to stimulate scientific exchange in chemical engineering, process engineering and biotechnology. We identify and evaluate emerging technological trends and facilitate the transfer of research results into industrial applications. DECHEMA has over 5,900 members – individuals, institutions and companies. Together with DECHEMA Ausstellungs-GmbH we are the organizers of ACHEMA

### BiobasedWorld at ACHEMA 2015

Technologies and products for the bioeconomy will be one of the central topics of ACHEMA 2015. In an era of increasingly expensive and dwindling fossil resources, there is an unprecedented demand for new technologies. The transition to a biobased economy is inconceivable without biotechnological methods. Not only research and process development, but also component producers, plant manufacturers and instrument and control technicians are under pressure to make the vision of a bioeconomy become a reality.

Hence topics like bioenergy (e.g. biofuels, biogas, biomass), biobased products (e.g. bioplastics, biobased chemicals, biocomposites) and bioproduction, are key elements of the exhibition, the congress and the partnering conference.

ACHEMA showcases the whole spectrum of players and is an indispensable forum for forging contacts and discussing new developments.

### Networking of research and technology

In addition to the exhibition, ACHEMA's second cornerstone is the international congress, comprising more than 700 lectures. Paper submission will be open to end of August 2014.

The new partnering feature helps ACHEMA and BiobasedWorld visitors and exhibitors to identify and contact each other already prior to and during the event.

Be informed. Be inspired. Be there.

# ACHEMA 2015

Frankfurt am Main - 15 – 19 June 2015

- ▶ World Forum and Leading Show for the Process Industries
- ▶ 3,800 Exhibitors from 50 Countries
- ▶ 170,000 Attendees from 100 Countries

**[www.achema.de](http://www.achema.de)**

# 3<sup>rd</sup> Conference on



# CO<sub>2</sub>

Carbon Dioxide  
as Feedstock  
for Chemistry  
and Polymers

[www.co2-chemistry.eu](http://www.co2-chemistry.eu)

## CO<sub>2</sub> as Chemical feedstock – a challenge for sustainable chemistry

2–3 December 2014, Haus der Technik, Essen (Germany)

### Entrance Fee

Conference incl. Catering

Two Days (2–3 Dec. 2014): € 790  
(incl. dinner buffet)

1<sup>st</sup> Day (2 Dec. 2014): € 470  
(incl. dinner buffet)

2<sup>nd</sup> Day (3 Dec. 2014): € 420  
plus 19 % VAT.

Undergraduate and PhD students  
can attend the conference with a  
50 % discount.

### 1<sup>st</sup> Day:

#### Political framework & visions

- Policy & visions
- CO<sub>2</sub> capture & purification
- H<sub>2</sub> generation: prerequisite  
for CO<sub>2</sub> economy
- CO<sub>2</sub> based fuels

### 2<sup>nd</sup> Day:

#### Chemicals & energy from CO<sub>2</sub>

- Natural and artificial  
photosynthetic systems
- Chemicals and building  
blocks
- Polymers & Materials

For the 3<sup>rd</sup> year in a row, the conference “CO<sub>2</sub> as chemical feedstock – a challenge for sustainable chemistry” will concentrate on this topic. More than 300 participants from the leading industrial and academic players in CO<sub>2</sub> utilization are expected to attend the conference and share their recent success stories, as well as new ideas and products in realization. Attending this conference will be invaluable for businessmen and academics who wish to get a full picture of how this new and exciting scenario is unfolding, as well as providing an opportunity to meet the right business or academic partners for future alliances. Visit our website: [www.co2-chemistry.eu](http://www.co2-chemistry.eu)



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## EUROPEAN BIOPLASTICS E.V.

### Foundation

- 1993

### Employees

- 10

### Branches

- Complete value chain of bioplastics industry

### Key materials

- Bio-based and/or biodegradable plastics

### Contact

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### Contact person



Kristy-Barbara Lange

Head of Communications

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# european bioplastics

## Association

European Bioplastics is the European association representing the interests of the bioplastics industry along the complete bioplastics' value chain – from manufacturers to brandowners and distributors. About two thirds of our 75 members come from Europe, the other third from the rest of the world with a strong interest in the European market.

Our vision is that bioplastics drive the evolution of plastics and contribute significantly to a sustainable society. That is why European Bioplastics aims to align the bioplastics value chain and to work in partnership with various stakeholders towards a favourable landscape enabling the bioplastics market to grow.

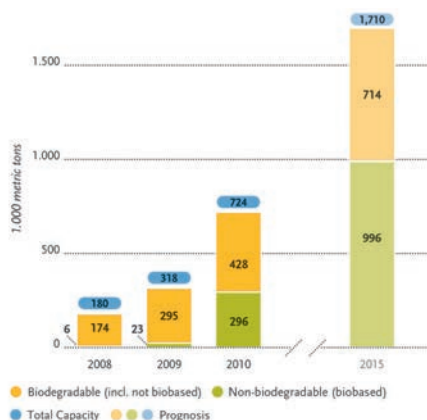
## Activities

European Bioplastics aspires to be a knowledge partner to its members. They rely on us as a platform to gain insights into the industry as a whole as well as into specific topics of our industry. Furthermore, we represent their business interests vis à vis important stakeholders and create new business opportunities by connecting them to other companies along the bioplastics value chain.

One of our most important tools to achieve this is the annual European Bioplastics Conference – the overall leading global event specialised on bioplastics with around 400 visitors each year. More information is available on the conference website: [en.european-bioplastics.org/conference2012](http://en.european-bioplastics.org/conference2012)

Our industry is growing dynamically around 20 percent per year. By providing a strong common platform, European Bioplastics will ensure that the European bioplastics industry and the European market will continue to thrive in the future.

Global production capacity of bioplastics





EIHA was founded in 2005 as an association for the members of the European Hemp Industry. Regular members include primary Hemp processors in the EU. Associate members may be associations, research organisations and companies and individuals working in the area of Hemp fibres, shivs, seeds and oil. EIHA today has 10 regular and more than 80 associated members from 40 countries. EIHA was founded to give industry a voice in Brussels. It has rapidly become a respected industry association that provides effective lobbying and serves as an information bank.

The annual EIHA conference ([www.eiha-conference.org](http://www.eiha-conference.org)) – has become a popular opportunity to meet, learn about developments and exchange views with their colleagues. With 200 participants from 39 countries the 2014 conference was the largest event on industrial Hemp worldwide!

The total world cultivation area was around 85,000 ha in 2011, approximately 60,000 ha for fibres (mainly China and Europe) and 25,000 ha for seeds (mainly Canada, China and Europe).

In 2014, Hemp is cultivated on 17,000 ha in the EU, the largest area for 10 years, with a growing share of seed production. Industrial Hemp is grown today in at least 13 Member States. The expected production of Hemp fibres is more than 20,000 t and for Hemp seeds about 10,000 t.

Industrial Hemp is well known for its strong fibres, which are increasingly used in the European automotive industry for the reinforcement of interior plastic parts, as well as for environment-friendly insulation material and cross growing fleeces. The woody core of the Hemp plant, shivs, is used for animal bedding, garden mulching, light weight particle boards and mixed with lime for domestic and industrial construction. Hemp seed and oil are a nutrition powerhouse with an outstanding fatty acid spectrum; its protein is balanced and easily digested. From the leaves and flowers of industrial Hemp pharmaceuticals such as CBD can be produced as a by-product. This high therapeutic and financial potential is a recent discovery.

The European Hemp Industry can deliver to your business Hemp raw materials with high quality, high social standards, low carbon footprint and an increasing volume that is price competitive. Hemp fibres will be probably soon be the first natural fibres with Sustainability Certification. For your requirements you can make contact with the Hemp processors via our website [www.eiha.org](http://www.eiha.org)



Picture sources (left to right): Hempro Int., NPSP, nova-Institute

## EUROPEAN INDUSTRIAL HEMP ASSOCIATION (EIHA)

### Foundation

- 2005

### Members

- Regular members: 10
- Associate members: 80

### Key services

- Effective lobbying at the European Commission in Brussels
- Consulting
- Networking
- Huge EIHA database, more than 300 presentations, reports and documents

### Contact

#### European Industrial Hemp Association (EIHA)

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### Contact person



Michael Carus  
Managing Director







## EUROPEAN POLYSACCHARIDE NETWORK OF EXCELLENCE (EPNOE)

### Members

- 16 academic institutions from 9 European countries.
- 20+ industrial members including SME's from 4 continents.
- Approx. 100 researchers directly embedded in the network.

### Research

- High quality research with an output of 100+ publications per annum.
- Participation in Europe-wide research.

### Knowledge Transfer

- More than 300 R&D projects running in the EPNOE community with a total research budget in excess of 30 million € per annum.

### Education

- More than 70 PhD students researching in EPNOE related topics.
- Academia-industry exchanges of students and post-docs

### Contact

#### EPNOE

MINES Paristech/CEMEF  
 BP 207  
 06904 Sophia Antipolis Cedex  
 France  
[www.epnoe.eu](http://www.epnoe.eu)

### Contact person

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EPNOE is the research and innovation network in Europe dealing with all aspects of polysaccharide and polysaccharide-based science and products. Its research road map is described in Persin et al., *"Challenges and opportunities in polysaccharides research and technology: The EPNOE views for the next decade"*, Carbohydrate Polymers, 84, 22–32 (2011). EPNOE is organised through a non-profit association, EPNOE Association.

### EPNOE Association activities

#### Research

- Very active, world-class research on all major polysaccharides.
- EPNOE scientists are editors or board members of most major journals in the field.
- EPNOE or EPNOE scientists organizing each year tens of conferences and symposia.

#### Innovation and applied research

- R&D project generations. Collective brain-storming; Face to face meetings with effective methodology to ensure total confidentiality.
- Huge experience in building and running projects (EC, national, academia-industry).

#### Sharing knowledge and information

- Description of activities and expertise of EPNOE scientists.
- Tool box: equipment list of EPNOE members.
- Title and summary of on-going PhD research in EPNOE members.
- Regular flow of news, due to the strong position of EPNOE scientists in many influent committees.
- Company and academic researcher's databases.

#### Education and training for students, young scientists and industrial researchers

- Education in an international community.
- Mobility of students and young scientists.
- Training courses for industrial scientists.

### Benefits to join EPNOE Association

#### For Companies

- Network with experts in this scientific field.
- Have access to scientists and engineers with the expertise to help develop your technologies, or provide scientific/technical assistance.
- Collaborate with industry and academic/research organisations to develop industry-focused R&D projects and consortia.
- Have an easier access for participation to EC projects.
- Share expertise and knowledge, technology development and optimisation.

#### For other Members

- To be embedded into a very active scientific network.
- To have the opportunity to create new contacts in other disciplines.
- To participate to research projects.





## Agency

The Fachagentur Nachwachsende Rohstoffe e.V. (FNR) is promoting the use of agricultural and forest resources on behalf of the Federal Ministry of Food and Agriculture (BMEL). FNR coordinates activities on renewable resources in Germany.

FNR is the central coordinating agency in Germany for the funding of research, development and demonstration projects. However, its tasks also include providing information and advice to a wide range of different targets groups as well as supporting the market introduction of products made from renewable resources.

By means of various publications and events, FNR not only ensures that specialists can keep up-to-date with the latest scientific developments, but also increases public awareness of renewable resources.

## Activities

As part of the funding programme „Renewable Resources“ the BMEL, through FNR, funds about 600 research, development and demonstration projects on renewable resources each year. The aim is to make domestically produced renewable resources a realistic and viable alternative to fossil fuels. FNR acts as an advisory agency to the Federal Government, the Federal States, industry, the agricultural and forestry sectors and other interest parties.

On European level FNR is coordinating several EU-projects in the field of renewable resources.

Consumer information is of vital importance. Despite recent increases in the use of renewable resources for energy and as raw material for a wide range of products, there is still much to be done to raise awareness.

Since 2003, bioenergy has been one of the major focuses of FNR's advisory services. This service targets people who operate bioenergy plants, those planning them and those wishing to invest in them, as well as at consumers who are considering using renewable energy from biomass.

The Building and Home advisory service is intended for house-builders, architects and craftsmen who wish to use the wide range of innovative products from renewable resources that are available for building, decoration and furnishing homes.

In 2010 FNR established an additional advisory service especially for communities that are interested in the usage of bioenergy and products from renewable resources.

The activities of FNR received major boosts by the Federal Government's action plan for the industrial use of renewable resources which was adopted in 2009. Especially for bio-based raw material including natural fibre reinforced plastics and wood-plastic composites an own action area was defined. Therefore, the biopolymer network was established as the "Information and Communication Platform for Science, Industry, Politics and Public" in 2011. The network is coordinated by FNR with the objective to increase the proportion of bio-based materials in total plastics production in Germany while also taking into account a holistic and case-specific life cycle assessment.

## FACHAGENTUR NACHWACHSENDE ROHSTOFFE E.V. (FNR)

### Foundation

- 1993

### Employees

- 82

### Branches

- Funding
- Advisory

### Contact

Fachagentur Nachwachsende  
Rohstoffe e.V. (FNR)

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### Contact person

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## INDUSTRIELLE BIOTECHNOLOGIE BAYERN NETZWERK GMBH



Netzwerk GmbH

### Foundation

- 2008

### Employees

- 5

### Network

- 100

### Branches

- Biotechnology
- Chemical industry
- Diverse process industries (e.g. biopolymers)
- Diverse supplier industries (e.g. biopolymers)
- Research & Development
- Innovation Activities

### Key services

- Technology transfer
- Project initiation and support
- Network management
- Public relations

### Contact

Industrielle Biotechnologie

Bayern Netzwerk GmbH

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### Contact person

Prof. Dr. Harlabos Zorbas

Managing Director

Industrielle Biotechnologie Bayern Netzwerk GmbH (IBB Netzwerk GmbH) is an organization focusing on the promotion of Industrial Biotechnology. The German company catalyzes the implementation of innovative biotechnological processes and procedures. IBB Netzwerk GmbH promotes technology transfer by connecting partners from industry and academy, e. g. to jointly carry out R&D projects.

### IBB-network

One of the main tasks of IBB Netzwerk GmbH is the management and coordination of the network IBB. Within this network, the competences and potentials of industry, small and medium enterprises, academia, business developers, consultants and associations are combined and mobilized to strengthen as well as to expand Industrial Biotechnology. The members produce, for example, biopolymers, specialty or bulk chemicals, biofuels, enzymes, colors, lubricants, adhesives and cleaning agents. Besides molecular biology techniques, IBB members have expertise in engineering, paper and environmental technologies, nanobiotechnology and bioinformatics. The IBB network is continuously expanded with new partners to increase the knowledge and capacity. This helps to create more, new ideas and projects with marketable products and processes.

### Cooperation network “BioPlastics”

In January 2014, the German Federal Ministry of Economic Affairs and Energy approved the application for the cooperation network “BioPlastics”, submitted by IBB Netzwerk GmbH. The interdisciplinary cooperation network wants to significantly increase the market share of bio-based, biodegradable polymers. The focus of the partners lies on technical projects for the development of innovative and low-priced biopolymers. These shall be used in mass-produced products such as packaging. IBB Netzwerk GmbH was commissioned by the participating partners with the network management. This includes expansion of the network, promotion of the network interactions and designing R&D projects.

### Services

IBB Netzwerk GmbH ...

- conducts technology scouting und market monitoring
- identifies suitable project partners
- connects companies and academia across sectors
- organizes meetings for IBB members, professionals and general public
- initiates and accompanies research and development projects
- builds the interface to appropriate financial sources and granting agencies
- performs administrative project management
- promotes and accompanies spin-offs and start-ups as well as the settlement of companies
- presents the concept and the achievements of the network in congresses and trade fairs
- provides the network and public with prepared relevant information
- abets the dialogue with politicians by organizing special events



IAR (Industries & Agro-Ressources) is a “world-class” competitiveness Cluster focused on bio-based products and biorefinery.

IAR brings together more than 250 stakeholders from Research, Higher Education, Industry (SMEs and Large Companies) and Agriculture (mainly from the regions Picardie



and Champagne-Ardenne), around a common goal: the optimal valorization of biomass. Our objective is to develop the regional economy, boost the competitiveness of companies and support local employment growth by leveraging innovation, training and partnership opportunities.

The commitment of all IAR's actors in the “cooperation-competition” creates synergies between SME's, Large Companies and Research Laboratories. It allows the development of a very strong R&I project dynamic around 4 fields within the Biorefinery concept: Biofuels, Biomaterials (biopolymers and bio-composites), Biochemicals and Bio-ingredients.

Since 2005, 169 projects have been launched with a total R&I budget of more than 1.4 billion €.

We also open our companies' development toward international cooperation and help our members to identify partnership opportunities in or outside Europe (i.e. Canada, USA, Japan, Malaysia, Brazil ...).



## INDUSTRIES & AGRO-RESSOURCES CLUSTER (IAR)

### Foundation

- Industries & Agro-Resources Cluster

### Employees

- 16

### Branches

- Bioenergy
- Biomaterials
- Biochemicals
- Bioingredients

### Key materials

- Agro-resources

### Contact

#### Industries & Agro-Resources Cluster

50–52 Bd Brossolette  
02930 Laon

France

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[contact@iar-pole.com](mailto:contact@iar-pole.com)  
[www.iar-pole.com](http://www.iar-pole.com)

### Contact person



Christophe Luguel  
[luguel@iar-pole.com](mailto:luguel@iar-pole.com)



## IOWA ECONOMIC DEVELOPMENT AUTHORITY

### Key figures

- Government Agency
- Site Location Assistance
- Regulatory Assistance
- Financial Assistance

### Contact

**Iowa Economic  
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 200 E Grand Avenue  
 Des Moines, Iowa 50309  
 USA  
 Phone: +1 515 725 3000

### Contact person



**Mark Laurenzo**  
[mark.laurenzo@iowa.gov](mailto:mark.laurenzo@iowa.gov)



### Iowa's Bioscience Industry Advantages

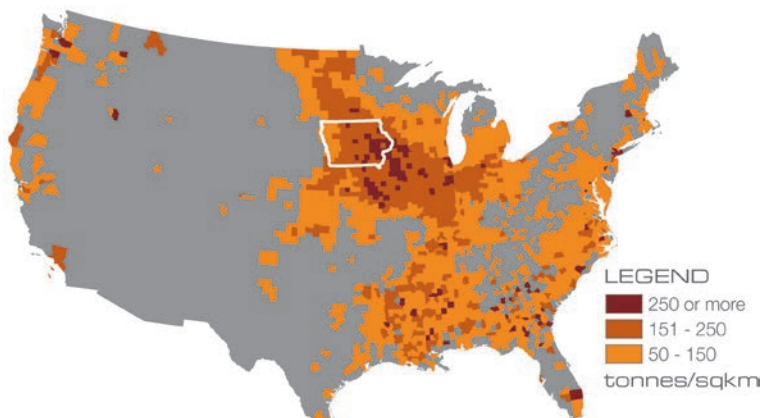
Located in the Midwestern region of the U.S., an area often referred to as the "American Heartland", the state of Iowa is capitalizing on its success in agriculture and its research capabilities in plant, animal and human biosciences to build a thriving biosciences industry in the state.

Iowa's preeminence in the bioeconomy platform stems from not only having some of the most fertile land in the nation, but is also a result of being able to successfully leverage its natural strengths in becoming a world leader in the use of biotechnology to enhance the value of crops and to supply value-added plant-based materials to new and expanding markets. That leadership, combined with a skilled, productive workforce and robust transportation infrastructure, make Iowa the perfect place to locate!

Iowa is focused on the use of biomass as feedstocks for the production of a broad range of industrial bio-based products including fuels, chemicals, polymers and materials. Iowa leads the U.S. in the availability of biomass and the most robust industrial biotechnology infrastructure available within the country. Companies already at work in Iowa include: POET-DSM, Roquette, DuPont Pioneer, Wacker Chemie, BASF, Monsanto and Syngenta.

Companies operating in Iowa benefit from a business-friendly state government, business-minded tax incentives and a skilled and productive workforce within a right-to-work state. For more information, contact the Iowa Economic Development Authority by calling +1.515.725.3100 or visit [www.iowaeconomicdevelopment.com](http://www.iowaeconomicdevelopment.com).

## Annual Biomass Resources





## Association

The Association of the German Wood-Based Panel Industries (VHI) represents the common interests of manufacturers of particleboards and fibreboards, plywood, wood polymer composites and internal doors to the public, the government bodies and other economic sectors in Germany and abroad.

The latest professional group under the roof of the VHI is working on wood polymer composites. Leading Central European manufacturers of this new material joined the VHI in 2005 to primarily coordinate the research on wood polymer composites, to initiate research, to facilitate the market entry of WPC-products by means of marketing and to create a quality seal.

## Material

VHI's specific fields of activity are inter alia:

- Support of the business forums "particleboards and fibreboards", "plywood", "wood polymer composites" and "internal doors" as well as of the committees for "technology" and "raw materials".
- Consulting on the fields of economy, technology and politics
- Initiation of research projects and market studies
- Specialist statements regarding European and national draft guidelines, -laws and -regulations
- Representation of branches in committees of public bodies, research institutions, national and European standardization bodies, professional associations and other relevant institutions
- Industry oriented public relations and marketing

## Products

The German wood-based panels and inner door industry produces an annual turnover of 5,5 bn Euro (2012) with 16000 employees. The production amounts to 5,6 mill. cbm of particleboards, 3,5 mill. cbm of fibreboards as well as 110,000 cbm of plywood and about 6,2 mill. internal doors.

## VERBAND DER DEUTSCHEN HOLZWERKSTOFF-INDUSTRIE E.V. (VHI)

### Foundation

- VHI – 1920
- Working Group WPC – 2005

### Branches

- Particleboards
- Fibreboards
- Plywood
- Wood Polymer Composites (WPC)
- Internal doors

### Key products

- Terrace flooring
- Facade profiles
- Window sills and others

### Contact

Verband der Deutschen  
Holzwerkstoffindustrie e.V. (VHI)  
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[www.vhi.de](http://www.vhi.de)

### Contact person



Dr. Peter Sauerwein  
Executive Director



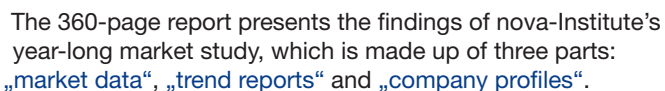






# R&D Consultants Certifiers





This also includes a one-year access to the „Bio-based Polymers Producer Database“



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# AgroTech

## Service Institute

Agriculture provides the industry with numerous biomass-resources for multiple applications such as packaging, car composites, insulation, building materials and lots of other products. Bio-materials and bio-plastics become more and more a part of a sustainable solution in the industry.

AgroTech is an authorized technological service institute which offers impartial consultancy and provides technological services within the fields of the agriculture, horticulture and food industry. AgroTech focus on sustainable commercial production of food and other bio-based products and operates within the intersection between agriculture, horticulture and the industry creating business development through knowledge and innovation. We specialize in providing cutting edge knowledge of biology and technology. The expertise covers all links in the value-chain from field to fork, and the company is directed to suppliers of machinery, facilities and technology used in the primary production as well as food businesses. One of our core business areas is biomass for bio-energy and bio-material purposes such as bio-composites and building materials.

## Services

Biomass possesses a range of basic components with interesting technical properties which can be used in multiple applications and often substitute unwanted materials being hazardous to health. New bio-products combine the demands for a positive climate print, being biodegradable, and feature lots of environmental beneficial properties.

## Products

AgroTech supports companies in product development with bio-based materials in multiple applications and assist in business and market development. AgroTech participates in research and development projects towards new and unknown materials from biomass and conversion of biomass and join biomass and bio-plastic networks.

We carry out quantitative impact study on biomass resources from the agricultural sector and the Aquarius sector. We complete tests, development and demonstrations within agricultural technology, biomaterials and bioprocess technology, environmental and energy technology, the area of domestic animals and food technology and technology within the greenhouse industry.



## AGROTECH – INSTITUTE FOR AGRI TECHNOLOGY AND FOOD INNOVATION

### Foundation

- 2007

### Budget/Turnover

- 11.5 million €

### Employees

- 87

### Branches

- Consulting
- R&D in agritechnology and foodinnovation

### Key materials

- Bio-based plastics and natural fibres for multiple applications

### Key products/services

- Impartial consultancy and technological services

### Contact

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Technology and Food Innovation

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### Contact person



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## ASTA EDER COMPOSITES CONSULTING

### Foundation

- 2011

### Key services

- Global market analysis
- Certification and labeling
- Techno-economical evaluation
- Distribution and marketing support: B2B and end customers
- Innovation workshops

### Key materials

- Bio-based plastics and composites especially Wood-Plastic and Natural Fibre Composites

### Contact

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Mobile: +43 (0) 676 36 31 455

[asta.eder@wpc-consulting.eu](mailto:asta.eder@wpc-consulting.eu)

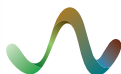
[www.wpc-consulting.eu](http://www.wpc-consulting.eu)

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ASTA EDER  
Composites Consulting

### Consulting

Asta Eder Composite Consulting (AECC) is located in Vienna, Austria. The roots of her childhood enveloped in the Finnish woods. She studied forestry in Austria and did her PhD on market opportunities of wood-plastic composites in the German speaking area. Dr. Asta Eder is one of the leading market experts on bio-based plastics and composites, especially on wood-plastic composites. Since about 15 years she is conducting market research and consulting for the development of new bio-based composites and their applications.

She is one of the main authors of nova-Institutes latest WPC/NFC study: <http://bio-based.eu/markets/>. She is part of the scientific committee of the French, German and North American WPC congress. Since 2013, Asta Eder also works for nova-Institute and will be the project leader of their “6th German WPC Conference” that will be held in Cologne in December 2015.

### Services

Asta Eder offers comprehensive market consulting for bio-based materials and products from raw materials up to end products.

During a consultation meeting, undiscovered innovation potentials of your company can be disclosed and evaluated by means of innovative workshops. Asta Eder possesses special know-how concerning methods of market research, to ensure the successful market launch of your product already during its development stage. We can help you to discern the unspoken needs of your future costumers.

Our market knowledge enables you to define your exact market positioning and the right certificates in relation to competitors and imports.

We offer well-founded reports as a basis of decision for your next innovation measures. According to the costumers wishes these can be based on idea workshops, focus groups, personal or online interviews as well as lead-user-analyses and conjoint analyses.

We support you with business models at planning the first steps of your production and offer you extensive consultation concerning market launch, business development and the search for distribution channels.



Wood-plastic composite granulates & bio-based composite cup ([www.burgerfoto.com](http://www.burgerfoto.com))





The Bioeconomy Science Center (BioSC) is an innovative competence center where the scientific expertise in bioeconomy research and modern infrastructure of the universities Bonn, Düsseldorf and RWTH Aachen as well as the Forschungszentrum Jülich are clustered.

The BioSC offers an integrated concept based on fundamental research linked to applied and industrial research in a range of fields related to the sustainable bioeconomy.

### Research

BioSC clusters all relevant scientific disciplines for the production of biomass and bio-based products and processes in the added-value network bioeconomy. Key topics are the sustainable production of plants as food/feed and biomass, new bio-/chemocatalytical and biotechnological methods and processes for the conversion of renewable raw materials in bio-based products, e.g. fine chemicals, proteins, enzymes, biopolymers, and biofuels.

### Key research areas are:

1. Sustainable Plant Production and Resource Stewardship
2. Microbial and Molecular Transformation
3. Chemical Engineering and Processing of Renewable Resources
4. Economy and Social Implications of the Bioeconomy

The transfer of research results into economic implementation is guaranteed by a close cooperation with industry partners.

### Education

The development and implementation of a sustainable and bio-based economy begins with the qualification of young people. Specialists are already required in all sectors of the knowledge-based bioeconomy. To implement the bioeconomy, a transdisciplinary future work force is of key importance. Therefore, the transfer of excellent basic knowledge and an holistic understanding of the challenges in bioeconomy are core features of the BioSC graduate education program.



## BIOECONOMY SCIENCE CENTER (BIOSC)

### Foundation

- 2010
- 56 Core groups

### Legal status

- Scientific cooperation alliance

### Technology

- Plant phenotyping, bioanalytics, bioinformatics, high-throughput screening/cultivation, iorefineries, omics technologies

### Products

- Food/feed, biobased chemicals, biobased materials, bioenergy

### Funding

- The BioSC is supported on a long-term basis by the state of North-Rhine Westphalia within the framework of the NRW-Strategieprojekt BioSC.

### Contact

#### BioSC office

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#### Dr. Christian Klar

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[biosc@fz-juelich.de](mailto:biosc@fz-juelich.de)



BioSC partners





## CHINA BIODEGRADABLE AND BIOBASED GROUP (BMG) & CHINA DEGRADABLE PLASTIC COMMITTEE (DPC)

### Foundation

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- 2001

### Members

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- 246 in China

### Key services

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- The committee formulates the standards about the biobased and biodegradable materials, etc.

### Contact

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China Biodegradable and  
Biobased Group (BMG) &  
China Degradable Plastic  
Committee (DPC)

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China

### Contact person

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BMG is a group of SAC/TC 48 of China with the purpose of developing the standards for biodegradable and biobased materials according to the ISO, EN, ASTM standards. BMG was constituted in March 2001 whose members include research institutes, manufacturers, consumers, etc. The objective of BMG is to develop standards for biodegradable, biobased materials, and to foster a favorable environment, in order to conduct them be produced, applied, disposing healthily and widely in China.

BMG was organized in 2001 by national center for standardization for plastics of SAC and intended to formulate national standards for degradable materials according to the ISO standards, e.g. ISO 14851, 14852, 14855, 17088, and ASTM D 6868, ASTM D 6400, ASTM D 6866 and EN 13432. In 2005, China degradable plastic committee (DPC) PIA has been set up based on the members of BMG and now DPC has 245 members. In 2009, National Technical Committee on Biobased & Degradable Materials and Products of SAC (SAC/TC380) has been set up based on BMG.



Beginning of 1990's Conenor started developing with its industrial partner Maillefer Extrusions and State Technical Research Center "VTT" its innovative and patented multi-rotor extruder Conex® which could extrude two or more different WPC-formulations into multilayer product structures without the need of cross-heads nor side extruders. Today Conenor has 3 industrial scale Conex®-lines and other related equipment for project work and trials at its extrusion lab facilities at town of Orimattila south of Finland.

Independent of Conex® offering, Conenor is today acting as international composite extrusion process and product developer, industry consultant and expert in client projects for natural fibre plastic and other waste based composites (NFC & WPC) and start-ups of new businesses. see reference [www.upmprofi.com](http://www.upmprofi.com)

Moreover the company is actively participating public funded R&D-projects where current examples are collaborative EU/FP7-projects "IRCOW" [www.ircow.eu](http://www.ircow.eu) and "OSIRYS" [www.osirysproject.eu](http://www.osirysproject.eu) for improved material recovery and resource efficiency in the building industry. New projects are under preparation within Horizon 2020.

#### Conenor offering includes:

- Market Knowledge & Information
- Profit/Loss Calculations
- Material Choices, Additives, Formulations
  - Product Design & Dimensioning
  - Single layer
  - Multilayer
- Optional Process Equipment and their Manufacturers (OEM)
- Client R&D and sampling activities
  - Client formulation development & optimization
  - Material screening trials with Conex® CWE 380-1 extruder
  - Multilayer profile sampling trials with Conex® CWE 500-2 extrusion line
  - Multilayer panel (400mm wide) sampling trials with Conex® CE 280-2 extrusion line
  - Testing of samples



Multilayer WPC-decking boards with recycled ABS(45%) +wood (55%) inside and recycled PE or PP (35%) +wood (65%) outside

#### Consultancy | Equipment

- Selection of Equipment & Tooling from worldwide Manufacturers
  - Material preparation, Mixing, Extrusion, Downstream
- Technical expertise and advise for the most optimal set-up
  - Twin screw extrusion technology for standard single layer products
  - Conex® 2-rotor technology for multilayer products
- Buy-or-Make evaluations
- Purchase negotiations on Client behalf
- Training & Know-how in process control and start-ups

## CONENOR LTD

### Foundation

- 1995

### Branches

- NFC
- WPC
- Construction

### Key materials

- Natural Fibres
- Thermoplastics
- Fillers
- Additives
- Waste
- Composites

### Key products/services

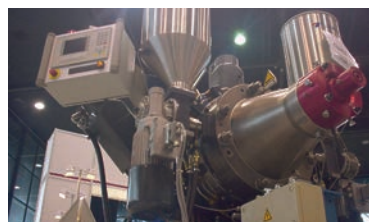
- Client R&D
- Feasibility Studies
- Multilayer Profile & Panel Extrusion
- Sampling of Materials & Formulations

### Contact

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## CSIRO MATERIALS SCIENCE AND ENGINEERING



### Foundation

- 1926 (CSIRO established)

### Employees

- ~ 70 effective full time research staff, inclusive of PhD students and post-doctoral fellows co-supervised with Australian universities.

### Key materials

- Bio-derived monomers and polymers
- Natural polymers and biodegradable polymers
- Natural fibres and biocomposites

### Key R&D/services

- Development of bio-derived chemicals through biorefinery (thermochemical, biocatalytic and chemical) processes
- Modification and thermal process of natural polymers
- Development of new applications for biodegradable polymers, natural fibres and biocomposites
- Structure/property and performance relationships in sustainable materials
- Accredited testing of compostability of materials

### Sustainable High Performance Materials

CSIRO (Commonwealth Scientific and Industrial Research Organisation) is Australia's national science agency and one of the most diverse scientific research organisations in the world. CSIRO employs some 6000 staff and has an annual budget in excess of \$1.3 billion. CSIRO Materials Science and Engineering is the largest of 11 divisions and hosts a range of scientific capabilities, which enables us to combine the scientific disciplines of biology, chemistry and physics with electrical, mechanical and software engineering to provide advanced materials based technologies.

Our R&D in the area of sustainable high performance materials seeks to develop technologies that maximise the value, performance and safety of advanced materials while minimising negative environmental impacts through their life-cycle. We have a particular focus on the development of bio-derived and biodegradable polymer materials and composites. We are your competent partner in all phases of material synthesis and modification, processing scale-up and application in the development of bio-based polymers and composites.

### Core Capabilities in the area of Bio-based Materials and Composites

- Biorefinery processing of woody biomass, algae, grasses and crop wastes via thermochemical, biocatalytic and chemical conversion/purification processes to obtain renewable chemicals on scales from laboratory to hundreds of kg/L.
- Development of biodegradable materials from natural polymers (starch, proteins, cellulose, natural resins, plant oils, etc.), synthetic polymers (PLA, PCL, PBSA, etc.) or CO<sub>2</sub>-based polymers (PPC) through chemical modification and thermal processing (reactive extrusion, thermal forming, injection moulding, foaming and powder processing)
- Processing of bast fibres, cotton and protein fibres into woven, knitted and nonwoven constructions at lab and pilot scale. Fibre surface modification including chemical and plasma processing. Incorporation of fibres and textiles into novel composite structures.
  - Morphology and interface design for biocomposites and biocomposite manufacturing.
  - Application development of biodegradable polymers and biocomposites
  - Biodegradation mechanism (including microbiology) studies and compostability testing

We also have significant research capabilities in other areas such as: functional surface modification and coatings, high performance resin development and composite fabrication, molecular modelling and property prediction of network polymers, self healing composites and adhesives, light weight, multifunctional protective materials, and nano-additives design, synthesis and dispersion.



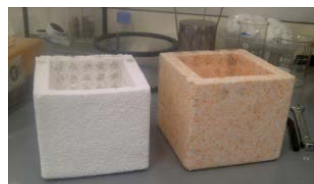


### Recent Achievements in Bio-based Plastics and Composites:

- Biocomposite shipping pallets as an alternative to hard wood timber pallets
- Biodegradable polylactic acid foaming technologies
- Starch-based biodegradable food packaging products
- Wheat gluten-based coatings for recycled paperboards for humidity resistance
- Powder processing of cellulose-based bio-waste into renewable and biodegradable bulk plastics

### Key Facilities

- Polymer Processing and Characterisation Facilities: including a series of reactive extruders from lab research desk-top machines to industrial scales, specific catalytic screw elements, co-extrusion (fibre, films, tubing), injection molding, compression molding, resin transfer moulding, batch mixers, various ovens and specialised polymer and composites characterization equipment (thermal analysis, chromatography, rheology and mechanical properties)
- Biorefinery facilities: bio-reactors on scales from lab research to industrial scale-up, stills, pyrolysis units, biocatalysis and large scale chemical conversion/purification facilities.
- Large-scale fibre, textile processing and testing facilities: fibre extrusion pilot plant, short staple and worsted ring spinning plants, capability to process any fibre and/or filament through to woven, knitted or nonwoven structures. National Association of Testing Authorities (NATA) accredited fibre and textile testing facilities for development and assessment of a wide range of new fibre and textile products.
- Biodegradation Facilities: NATA accredited facilities to test the compostability of materials, including biodegradation testing in aerobic compost, disintegration testing in a pilot scale composting bin, higher plant ecotoxicity testing and earthworm ecotoxicity testing.
- Surface Engineering and Electrostatic Powder Coating Facilities: robotically incorporating multifunctional interphases or surfaces of products, electrical charge transfer combined with adhesion promotion and biocompatibility (lab & process scale-up)



### Contact

#### CSIRO Materials Science and Engineering

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## DIN CERTCO GMBH

### Foundation

- Founded 1972 by DIN e.V., Deutsches Institut für Normung
- Since 1995 "DIN CERTCO GmbH"
- Since 2005: Shares belong to TÜV Rheinland Group and DIN e. V.

### Company

- Accredited certification body by DAkkS (D-ZE-11125-01-00)
- Access to over 27.000 experts in the field of standardization

### Branches

- Products
- Services
- Persons and
- Systems

### Key products

- "Seedling" Compostability mark
- "DIN-Geprüft" (= "DIN-tested") certifications
- Industrial compostable products
- Home compostable products
- Biobased products
- Additives according to EN 13432
- Recycled content
- Desiccant bags
- Corrugated cardboard
- Wood pellets
- Plastic tubes
- Pallets made from Polyethylene for the Food Hygiene Sector
- PEFC Chain of Custody



TÜVRheinland®

DIN CERTCO

Precisely Right.

### Company

DIN CERTCO is the partner to contact for all aspects of conformity assessment. As the subsidiary of TÜV Rheinland, a global leader in independent testing and assessment services, we certify the safety and quality of new and existing products, systems and services.

With more than 130 approved or recognized testing laboratories world-wide bound by contract in all fields, DIN CERTCO separates testing, assessment and certification as a company philosophy.

### The mark shows the difference

With our certification marks you are able to highlight the sustainability of your products, systems or services. Create advantages on the market by using our significant certification marks standing for confidence for more than 40 years. We are your independent partner for environmental certification!

### Benefits:

- Independent certifications by third parties enhance credibility, especially in the age of green washing
- Market advantage through technology and quality products
- Benefit from the international awareness of our DIN-Geprüft marks
- Transparent and effective advertising documentation of your certificates in the certificate database on the Internet at [www.dincertco.de](http://www.dincertco.de) with further product information and link to your website
- Use synergies: the proximity to TÜV Rheinland and the DIN German Institute for Standardization e.V.

### For you – Practically

After positive assessment DIN CERTCO confirms, that your product, system or service fulfills the requirements stated in the respective certification scheme.

### Our services in the environmental field

We are aware that many of today's products deliver much more than just compostability and biodegradability. With our many years of expertise in the field of environmental science we can offer a range of certification options for compostable and/or bio-based products. This diversity enables us to offer you a wide range of services and the best thing about it is, with us, it's you who chooses which of these services to use.



TÜVRheinland®

DIN CERTCO

Precisely Right.

For you – we certify

In the field of compostable products.	In the field of biobased products.	Different product qualities – with a combined mark.	In the field of recycled content.
<p><b>Compostable products and packaging:</b> With the certification marks for:</p> <ul style="list-style-type: none"> <li>■ Additives EN 13432</li> <li>■ Seedling</li> <li>■ DIN-Geprüft industrial compostable</li> <li>■ DIN-Geprüft home compostable</li> </ul> <p>DIN CERTCO offers the full variety of certification systems for products made of compostable materials covering the latest national and international standards available.</p>	<p>Documentation of bio-based raw materials used.</p> <ul style="list-style-type: none"> <li>■ DIN-Geprüft biobased</li> </ul> <p>The certification mark shows the proportion of biobased carbon related to the product's total organic carbon in three possible percentage ranges. Certification is conducted based on the ASTM D 6866 standard.</p>	<p>The combined mark allows you to show efficiently and clearly different certifications in these fields. You choose whether you want to document individual product qualities, such as suitability for industrial composting, suitability for home and garden composting, or the use of renewable raw materials, or several of these product qualities at the same time. A precondition for this is that the requirements of more than one of the existing DIN-Geprüft certifications are fulfilled.</p>	<p>In addition to self-declaration via the „Mobius loop“ in accordance with DIN EN ISO 14021, this certification scheme provides means to verify the recycled content of a product or of individual components. This independent certification mark shows accordance with the standards DIN EN ISO 14021 and DIN EN 15343.</p> <ul style="list-style-type: none"> <li>■ DIN-Geprüft Recycled Content</li> </ul>

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**Contact person**

Lukas Willhauck

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## FRAUNHOFER INSTITUT FÜR ANGEWANDTE POLYMERFORSCHUNG (IAP)

### Foundation

- 1992
- Director Prof. Dr. habil.  
Hans-Peter Fink

### Turnover

- 16 million €

### Employees

- 200

### Branches

- Polymer industry, Pulp and  
Paper industry, Chemical  
industry

### Key materials

- Cellulose, xylan, lignin, starch,  
PLA, PHA, bio-PA, bio-based  
composite materials

### Key products

- Chemical analytics
- Solid state characterization  
(NMR, X-ray, TEM, REM)
- Synthesis and derivatization
- Compounding and recipe  
development
- Bio-based precursors for  
carbon fibers
- Spinning of fibers, films and  
non-wovens
- Composite development

### Contact

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### Much more than plastics

#### The Fraunhofer Institute for Applied Polymer Research IAP

High-performance fibers for fast cars, organic light-emitting diodes for flat screens or artificial corneas for eye implants – For over 20 years the Fraunhofer Institute for Applied Polymer Research IAP in Potsdam-Golm develops polymers. Our materials and methods cover the entire range of polymer applications. We also create conditions which ensure that the developed methods do not only work on a laboratory scale, but also under production conditions.

Fraunhofer IAP supports your efforts regarding bio-based plastics and composites along the value chain, from bio-based monomers and native biopolymers via the development of bio-based materials and the related processing technologies up to product development and substantial upscaling.

### Services

Polymers from renewable raw materials are synthesized, modified, characterized, compounded, and processed at Fraunhofer IAP. In the focus of interest are natural polymers such as polysaccharides (e.g. cellulose, starch), lignin, and proteins, as well as bio-based polymers such as polylactic acid (PLA), polyhydroxyalkanoates (PHA), and other bio-based polyesters, polyamides, and epoxies. For creating new polymers either monomers are combined into new polymers and copolymers, or existing bio-polymers – utilizing nature's synthesis work – are chemically modified. By the use of additives, polymeric blend partners, reinforcing fibers and nano-fillers, recipes are developed and processing parameters are determined for each application in question. Methods for melt and solution processing include film and blown film extrusion, non-woven melt blowing, injection molding, and fiber spinning. In addition to mechanical properties such as stiffness, strength, and impact strength, also thermal properties such as heat distortion temperature, maximum service temperature, and glass transition temperature as well as permeation properties are optimized. For specific applications, e.g. films, bottles, injection molding parts, or fibers, tailor-made bio-based materials can be developed on your behalf.



Spinning equipment for  
cellulose fibers



Testing mechanical  
properties of biobased  
plastics



Compounding  
thermoplastics with  
cellulose man-made fibers



## Institute

The main research activities of the Fraunhofer Institute for Wood Research WKI in Braunschweig are the manufacture and improvement of innovative wood-based composite materials such as particleboards, fibreboards and wood-polymer composites (WPC), the development of durable coatings based on renewable resources, measurements of emissions and application of non-destructive techniques for various materials and products. In addition, Fraunhofer WKI is working in the following areas: Building physics, including natural and artificial weathering, weathering simulations, corrosion protection, evaluation of hygrothermal material properties, and fire safety.

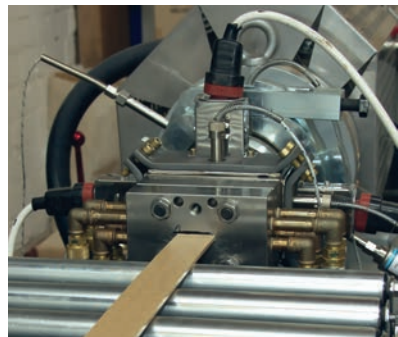
## Services

We can produce wood and natural fiber-based composites using various techniques such as extrusion and hot-pressing and determine their mechanical, thermal and physical properties according to your requirements. We have equipment for reducing wood and other lignocellulosics to chip form, for sieving and sorting as well as drying. A laboratory-scale refiner plant with a double disc refiner can be used to produce thermomechanical pulp (TMP) and chemo-thermomechanical pulp (CTMP) from various lignocellulosic materials. Resins and additives can be added to lignocellulosics using blow-line application in our refiner plant. Hollow-core profiles or tapes can be manufactured on a conical, counter-rotating twin-screw extruder (54 mm screw diameter). A parallel, co-rotating compounder, a thermokinetic mixer and a Palltruder (plast agglomerator) can be used to prepare compounds.

### Current WPC research projects are:

- Use of refiner wood fibres (TMP fibres) for WPC extrusion
- Preparation of polymer blends based on engineering polymers in virgin and recycled forms
- Bonding of WPC profiles
- Coating of WPC with Water-based, solvent-free coatings

Fraunhofer WKI is an accredited testing laboratory for WPC decking according to the "Qualitätsgemeinschaft Holzwerkstoffe e.V." in Gießen, Germany.



## FRAUNHOFER INSTITUT FÜR HOLZFORSCHUNG (WKI)

### Foundation

- 1946

### Employees

- 117

### Branches

- Wood-based Panels and Wood-Polymer Composites Industry, Coatings, Wood Engineering and Construction, Fire Safety, Emissions

### Key materials

- Wood, Natural fibres, Refiner fibres, Wood-based Panels, Wood-Polymer Composites, Coatings

### Key products/services

- Wood-based Panels, Wood-Polymer Composites, Coatings

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### Contact person



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## FRAUNHOFER INSTITUT FÜR UMWELT-, SICHERHEITS- UND ENERGIETECHNIK (UMSICHT)

### Foundation

- 1990

### Total returns

- 26.4 million €

### Employees

- 225

### Branches

- Plastics processing industry
- Packaging industry
- Consumer goods and automotive industry

### Key materials

- Bio-based plastics and monomers
- Biodegradable plastics

### Key products/services

- Development of bio-based materials, products and their processing technologies
- Pilot and small scale production of bio-based plastics and compounds
- Certified testing of biodegradability
- Life Cycle Analysis (LCA)

### Contact

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## Fraunhofer UMSICHT

### Institute

Fraunhofer UMSICHT develops applied and custom-made solutions in the fields of environmental and process engineering, material and energy technology. Assuming a leading position Fraunhofer UMSICHT is committed to sustainable development, environmentally friendly technologies and innovative approaches designed to improve the standard of living and to promote the economies innovative capacity.

Fraunhofer UMSICHT is your competent partner in all phases of development and market introduction of bio-based materials. Based on our long-term scientific experience we create innovations: from the first project idea over the joint discussion of product requirements, the production of material samples to practical application tests.

### Services

The department "Bio-based Plastics" is focused on polymer chemistry, material development, plastics processing, applications, and industrial scale-up of novel bioplastics. This topic comprises plastics derived from biomass as well as biodegradable plastics. Our equipment covers laboratory and testing facilities, kneaders and laboratory compounding extruders, and industrial plastics processing lines (e.g. compounding, extrusion, injection moulding). Additionally we assess products and value chains with respect to their sustainability.

### R&D Portfolio

- Development of new bio-based monomers and plastics
- Material and product development
- Plastics processing development
- Small scale and pilot series manufacturing of plastics compounds and products
- Polymer analyses and material testing
- Certified testing of biodegradability of substances, materials and residues
- Market and feasibility studies, technological assessments
- Life Cycle Analysis (LCA), Carbon Footprint







# IKT KUNSTSTOFF TECHNIK STUTTART

## Institute

The Institut für Kunststofftechnik (IKT) at the University of Stuttgart is an R&D-institute, active on fields of material engineering, processing technology and product engineering. Besides the research on conventional plastics processing technologies and conventional applications, the development of improved bio-based compounds is a focus of the institute.

The IKT is a comprehensive R&D partner to develop new biobased compounds and to realize new biobased applications. A wide range of processing and characterization techniques under one umbrella enables the IKT to conduct fast and effective developments for the industry.

## Service in the field of bioplastics

- Material development/Compounding (ZSK 18/25/26/40)
- Material characterization: Full range of chemical-, thermal-, rheological and mechanical characterization (accredited testing laboratory)
- Processing techniques: Extrusion (blown film and flat extrusion), injection moulding, injection moulding compounding, thermoforming, 3D-printing

## Current activities in the field of bioplastics

- Impact modification of different bioplastics by reactive extrusion
- Modification of PLA for foamextrusion
- Enzymatic modification of cellulose
- Development of biobased materials for the fused deposition modeling process (3D-printing)
- Analysis of the degradation of bioplastics in marine habitat
- Welding of bioplastics blends and analysis of the weld line morphology



## INSTITUT FÜR KUNSTSTOFFTECHNIK (IKT)

### Foundation

- R&D on the fields of material engineering, plastics processing and plastics product engineering

### Employees

- Approx. 50

### Key services

- Compounding
- Material characterisation
- Product design
- Processing

### Contact

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# International Conference of the European Industrial Hemp Association (EIHA)

[www.eiha-conference.org](http://www.eiha-conference.org)

**20–21 May 2015**

**Rheinforum, Wesseling / near Cologne (Germany)**

Conference language: English

**++ Cultivation ++ Processing ++ Economy ++ Sustainability ++ Innovation ++**



Pictures: Hempro Int., nova-Institute, Hook

**Don't miss the largest industrial hemp event in 2015 – world wide!**

**++ 200 participants from 39 countries in 2014! ++**

The conference will focus on the latest developments concerning industrial hemp and other natural fibres as well as hemp seeds, shivs, oil, proteins and pharmaceuticals.

## Applications

- Fibres & shivs
- Bio-Composites
- Insulation
- Construction
- Textiles
- Hemp seeds, oil and proteins
- Pharmaceuticals

## Spectrum of participants

- Natural fibre industry
- Hemp food and feed industry
- Cultivation consultants
- Engineers
- Traders and investors
- Research and Development

## Exhibition

You are welcome to present your latest products, technologies or developments – book a stand and a bulletin board now for only 200 EUR (plus 19% VAT).

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Organiser



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[www.winicop.org](http://www.winicop.org)



[www.bio-based.eu/news](http://www.bio-based.eu/news)



[www.plastixportal.co.za](http://www.plastixportal.co.za)



# Wood K plus

## Company

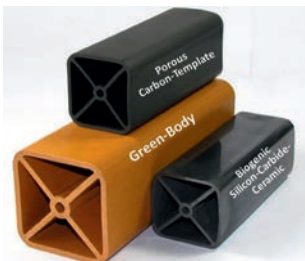
The Kompetenzzentrum Holz GmbH (Wood K plus) is a research service provider for the wood working industry as well as for the polymer- and chemical industry. Innovative timber materials, optimized production processes in the timber production industry and wood chemistry as well as new technologies and products in the field of polymer-composites are the main research objectives of the Competence Center for Wood Composites and Wood Chemistry. The Competence Center demonstrates with its 105 employees one of the most powerful and biggest (wood) research institutes in Central Europe.

## Service

The division "Wood Polymer Composites" concentrates with its main research areas Wood-Thermoplastic-Composites (WPC), Wood-Thermoset-Composites and Ceramic Materials on the knowledge based development of composites from wood particles, wood flour, wood fibres or man made fibers and polymers (virgin and recycling materials) as well as carbon materials and ceramics derived from that composites. The necessary infrastructure for mixing, compounding, extrusion, injection moulding and high temperature processes as well as for the mechanical, thermal and physical characterization of composite materials is available. A professional handling of research activities assure the 23 high qualified employees of the division.

The research services of the division "Wood Polymer Composites" range from small testing/characterization jobs over medium term research appointments up to long term research & development projects:

- Raw material analysis (lignocellulosics and polymers)
- Material testing, component testing (mechanical, weathering, ...)
- Material/formulation development
- Compounding trials, extrusion trial, injection moulding trials
- Development of carbon and ceramic materials from thermoset based WPC



## KOMPETENZ- ZENTRUM HOLZ GMBH

### Foundation

- January 2001

### Turnover

- 8 million €

### Employees

- 105

### Branches

- Chemical industry
- Wood working industry
- Pulp and Paper industry
- Polymer industry

### Key materials

- Wood and natural fibres
- Cellulose fibres
- Thermoplastics
- Thermosets

### Key products

- Wood Polymer
- Wood Composites
- Man made fibres
- Particle boards, Laminates
- Papers, Paper boards

### Contact

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Fax: +43 (0) 732 24 68 67 70  
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### Contact person



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# New 'basics' book on bioplastics

This new book, created and published by Polymedia Publisher, maker of bioplastics MAGAZINE is now available in German and English language.

The book is intended to offer a rapid and uncomplicated introduction into the subject of bioplastics, and is aimed at all interested readers, in particular those who have not yet had the opportunity to dig deeply into the subject, such as students, those just joining this industry, and lay readers. It gives an introduction to plastics and bioplastics, explains which renewable resources can be used to produce bioplastics, what types of bioplastic exist, and which ones are already on the market. Further aspects, such as market development, the agricultural land required, and waste disposal, are also examined.

An extensive index allows the reader to find specific aspects quickly, and is complemented by a comprehensive literature list and a guide to sources of additional information on the Internet.

The author Michael Thielen is editor and publisher bioplastics MAGAZINE. He is a qualified machinery design engineer with a degree in plastics technology from the RWTH University in Aachen. He has written several books on the subject of blow-moulding technology and disseminated his knowledge of plastics in numerous presentations, seminars, guest lectures and teaching assignments.



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## Institute

The Kunststoff-Institut Lüdenscheld unites cutting-edge know-how with the latest production technologies to further boost quality and economic efficiency – particularly focusing on injection-moulded parts made of thermoplastics and thermosets.

The company is certified in accordance with DIN EN ISO 9001 and the laboratory is accredited in accordance with DIN EN ISO/IEC 17025:2000.

## The Kunststoff-Institut Lüdenscheld

- Supports you in selecting, developing, optimising and implementing products, tools and processes in all areas of plastics technology
- Offers in-depth services in adjacent fields of polymer technologies regarding innovation, research and development within its business domains
- Was founded in 1988 as an “extended workbench”, which makes it the most experienced service provider in this sector
- Currently employs around 70 employees
- Generates an annual turnover of around seven million Euros each year

## Service

Our competences include:

- Materials engineering/  
New materials development
- Testing and Analysis  
technology
- Surface technology
- Application engineering/  
Process integration
- Mould technology/  
Coating technology
- Strategic market development
- Education and Training
- Joint projects, e.g. “Applications of sustainable materials – technical use of biobased materials 2”



## Activities in the field of biopolymers

- Market research – evaluation and supply of information sources, databases or studies, etc.
- Material selection with the aid of checklists
- Rating the materials with regard to the processing conditions (material preparation, plastication, flow characteristics)
- Examination of constructive and mould specific issues
- Analysis of material properties (e.g. shrinkage or warpage)
- Material tests against the background of specific requirements from different industries – e.g. odourtest, fogging, aging tests (solar simulation, weathering, climate storage)
- Implementation of selected surface and decoration processes for the verification of the practicability (varnishing, 3iTech®) and implementation of proper surface characterisations

## KUNSTSTOFF-INSTITUT LÜDENSCHELD

### Foundation

- 1988

### Budget

- > 7 million €

### Employees

- Approx. 70

### Branches

- Support in all areas of plastics technology

### Key materials

- Thermoplastic and thermoset materials

### Key products/services

- Material testing and failure analysis
- Materials Engineering/  
New Materials
- Surface technology
- Process engineering  
and development
- Joint projects

## Contact

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## NAROCON CONSULTING KAEB

### Foundation

- 1997

### Branches

- Consultancy
- Bioplastics
- Biobased Chemistry
- Market Intelligence
- Communication
- Policy Affairs
- Technical & Legal Framework

### Contact

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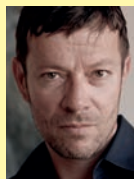
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### We Serve Green Pioneers to Build the Biobased Economy

narocon offers consulting services for the strategy development and implementation of an innovative biobased product business. narocon is serving public and private partners to pioneer the biobased economy. Most of our clients are SME and corporations producing and using biobased polymer products.

Harald Kaeb, the founder and owner of narocon, has a 20 years track record of services dedicated to innovate chemistry and plastic businesses. He is a PhD chemist, and has managed the European Bioplastics industry association and chaired its board from 1999 to 2009. Harald truly is a green pioneer, and still fully dedicated.

Sustainable development is our golden guideline. We believe in critical and constructive dialog based on facts and science. A longstanding expertise in various fields and insights from a huge global network of partners are our assets.

We serve to set up, evaluate or optimise integrated business development concepts covering

- Sourcing of agricultural feedstocks
- Technology and value chain partnerships
- Market intelligence and customer support
- Technical framework and quality instruments
- Communication: Claims, public relations and policy affairs
- Issue management: Sustainability proof and regulations
- End-of-life options

narocon and its network of the best experts are guiding pioneers to market and business success. There is no need to repeat failures or re-invent the wheel. Spend valuable resources more efficiently.

If you think that knowledge is expensive try ignorance.





**NNFCC**  
The Bioeconomy Consultants

## Background

NNFCC is a leading international consultancy with expertise on the conversion of biomass to bioenergy, biofuels and biobased products. Our award-winning consultancy helps industry solve complex business challenges and provides vital evidence for policy makers.

NNFCC has earned a reputation as a leading international consultancy with expertise on the conversion of biomass to bioenergy, biofuels and bio-based products. Our award-winning consultancy helps industry solve complex business challenges and provides vital evidence for policy makers. Whatever the scale, we can assist you in realising your development project.

## Services

- Future market analysis
- Feedstock and logistics planning
- Sustainability strategy development
- Initial technology and economic appraisal
- Project feasibility assessment
- Policy and regulatory support

## Biobased Products Consultancy

The global marketplace for biobased chemicals and polymers is increasing rapidly and there is intense activity from renewable feedstock suppliers, manufacturers, brand owners and retailers all looking to secure their positions in this key market.

Innovation in biotechnology and green chemistry has accelerated the development of economic routes to both conventional and novel materials from biological sources, like bioplastics.

NNFCC provides high quality, industry-leading technical consultancy on bio-based products, such as biobased chemicals, biopolymers and bioplastics. Working with us enables you to stay ahead in a complex and constantly changing marketplace.

Our commercial services have been tailored to assist organisations in understanding the opportunities and overcoming the challenges presented by the emerging bioeconomy.

We offer technical consultancy covering:

- |                                       |  |
|---------------------------------------|--|
| ■ Future market analysis              | ■ Technology evaluation and associated due diligence |
| ■ Feedstock logistics planning        | ■ Project feasibility assessment                     |
| ■ Sustainability strategy development | ■ Policy and regulatory support                      |

## Case Studies

Examples of some of the types of project we have been involved in are:

- Evaluating markets for bioplastics
- Developing a compostable packaging standard
- Advising event organisers on packaging
- Assessing sustainability of renewable packaging
- Measuring biobased content in energy from waste
- Enabling collaborative research

## NATIONAL NON-FOOD CROPS CENTRE (NNFCC)

### Foundation

- 2003

### Branches

- Bioplastics
- Renewable packaging
- Life cycle assessment
- Labelling
- End-of-life options
- Consultancy

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## NOVA-INSTITUT GMBH

### Foundation

- 1994

### Turnover

- 2 million €

### Employees

- Approx. 20

### Customers

- Industry: automotive, chemicals, construction, plastics, engineering
- Consulting
- Associations
- Ministries
- Research institutes

### Key topics

- Raw Material Supply
- Techno-Economic Evaluation (TEE)
- Market Research
- Environmental Evaluation
- Dissemination & Marketing Support
- Political Framework & Strategy
- Departments:
  - Sustainability
  - Technology & Markets

### Key services

- Research & development projects
- Industrial & political consultancy
- Conferences & dissemination

### More information

You may find all information on conferences and have access to our bio-based news, along with papers on bio-based policy, studies on LCA and Meta-Analysis of LCAs, market studies and more on: [www.bio-based.eu](http://www.bio-based.eu)



### Institute

The nova-Institute was founded as a private and independent institute in 1994. It is located in the Chemiepark Knapsack in Huerth, which lies at the heart of the chemical industry around Cologne (Germany).

For the last two decades, the nova-Institute has been globally active in feedstock supply, techno-economic evaluation, market research, dissemination, project management and policy for a sustainable bio-based economy.

### Key questions regarding nova activities

What are the most promising concepts and applications for industrial biotechnology, biorefineries and bio-based products? What are the challenges for a post petroleum age – the Third Industrial Revolution?



### Fields of activity

nova-Institute offers research, consultancy and dissemination with a focus on bio-based and CO<sub>2</sub>-based economy in the fields of feedstock, techno-economic evaluation, markets, LCA, dissemination, B2B communication and policy. Today, nova-Institute has more than 20 employees and a yearly turnover of about 2 million €.

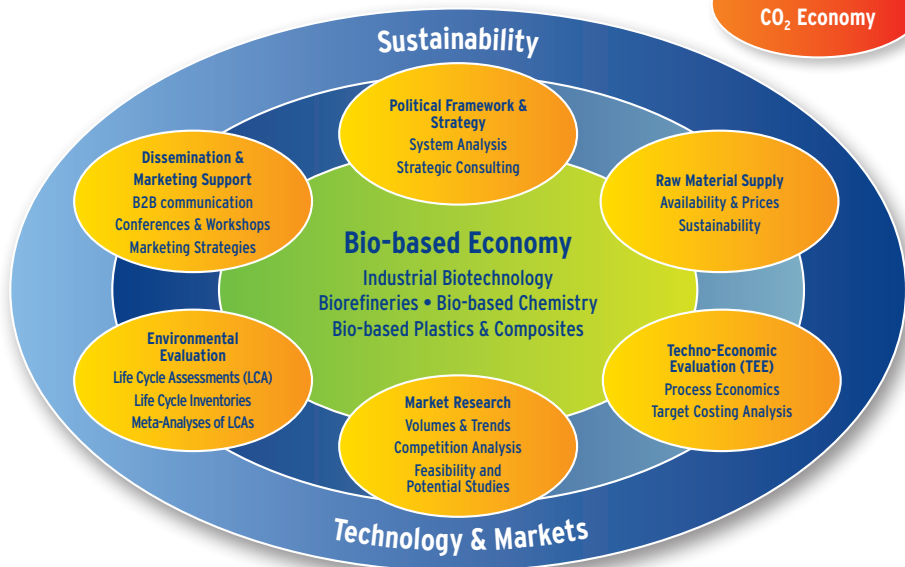
### Associations and bodies

The nova-Institute is a member of various international associations and committees. We are founding member of the Cluster Industrial Biotechnology CLIB2021 (Duesseldorf), member of the Federation of Reinforced Plastics (AVK), member of the Biobased Industries Consortium BIC (Brussels), the subgroup „Natural Fibres Reinforced Plastics“ (Frankfurt a. Main), member of kunststoffland NRW e.V. (Duesseldorf) – Plastics Manufacturers Association in the German State of North-Westphalia.

nova-Institute is the executive office of the European Industrial Hemp Association (EIHA), which is member of the Technical Committee, CEN/TC 411 “Bio-based products” (since 2011) and member of the biomass supply Thematic Working Group of the “Bioeconomy Panel” of the European Commission (since 2013) as well as member of the Standing Committee on Agricultural Research (SCAR), working group “Sustainable Bioresources for a Growing Bioeconomy” (since 2014).



New Field  
CO<sub>2</sub> Economy



### Selected customers

**Automotive Industry:** BMW, Brose, Faurecia, Ford, Johnson Controls, Mercedes/Daimler Quadrant

**Chemistry, plastics and biomaterials:** Arizona Chemical, BASF, Corbion (formerly PURAC), ESE Expert, Evonik, FKuR, Honeywell, IKEA, InfraServ, KOSCHE, LEIFHEIT, LOGOCOS, Teijin

**Engineering:** Coperion, FERROSTAAL, Reifenhäuser, Uhde-Inventa Fischer

**Consulting:** AFC Consulting (DE), BLEZAT CONSULTING (FR), Clever Consult (BE), Ernst & Young (FR/DE), KPMG (MY), meó Consulting (DE)

**Associations/ Clusters/ NGOs:** AVK, CEFIC, CLIB2021, European Bioplastics, EIHA, IAR, VHI, WWF (USA)

**Ministries & Institutions:** BfN (DE), BMELV (DE), DBU (DE), DEFRA (UK), DECC (UK), European Commission, FAO, FNR (DE), GIZ (DE), KfW (DE), NIA (TH), UBA (DE), Netherlands Enterprise Agency (NL), Ministry of Economic Affairs (NL)

**Research Institutes:** Fraunhofer UMSICHT (DE), HS Bremen (DE), IFEU (DE), INRA (FR), INNVENTIA (SE), Joint Research Centre (EU), London Imperial College (UK), Öko-Institut (DE), RAPRA (UK), VTT (FI), Wageningen UR (NL), Wuppertal Institut (DE)

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## POLYMEDIA PUBLISHER GMBH

### Foundation

- 2006

### Branches

- Plastics Industry
- Packaging Industry
- Automotive Industry
- Consumer Electronics
- All Industries
- Academia
- Politicians

### Key materials

- Bio-based Plastics
- Biodegradable Plastics

### Key products

- Bioplastics MAGAZINE
- Conferences
- Consulting

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# bioplastics

M A G A Z I N E . C O M

## Product

The success of bioplastics magazine in the first 8 years proves that there is a real need for a trade magazine dedicated exclusively to bioplastics, i.e. plastics from renewable resources and biodegradable plastics including natural fibres. bioplastics MAGAZINE covers all topics of these bio-based plastics and biodegradable plastics, many of which fulfilling both aspects.

The magazine keeps its readers updated about the different bioplastic resins which are available and will come up in future, about chemistry, properties and availability. bioplastics MAGAZINE covers the processing techniques of these fascinating materials such as film blowing, extrusion, thermoforming, blow moulding, injection moulding etc. A large part in bioplastics MAGAZINE is dedicated to current and future applications. As of today, the lions share are packaging applications, but other industries are following. Even producers of consumer products such as covers for cellphones, laptop-computers or toys are interested in this family of materials as well as the automotive industry and many others – or they are already using bioplastics in certain products. Another quite important aspect is the political situation. bioplastics MAGAZINE reports about regulations, certifications and all end-of-life options. bioplastics MAGAZINE is THE information platform for all parties involved.

It is read by decision makers in all parts of this business, e.g. the raw material suppliers and compounders, machine and mould makers, converters, brand owners, the complete trade chain (wholesale and retail) as well as scientists and politicians, as bioplastics MAGAZINE is an independant and neutral source of information. With an average print run of 5000 (depending on large events like exhibitions or conferences) the estimated number of readers is much bigger, as many copies of bioplastics MAGAZINE are circulated or passed on to other interested readers. Since its start in early 2006 bioplastics MAGAZINE has experienced a constant, and very positive, feedback from its readers. The number of subscriptions is continuously increasing.

bioplastics magazine also organizes high class conferences, such as the PLA World Congress (2009, 2012 and 27<sup>th</sup>–28<sup>th</sup> of May 2014) in Munich or “bio!pac 2015”, the “biobased packaging” conference in May 2015 in Amsterdam.

The print magazine is published 6 times a year in English language. Subscribers get bioplastics MAGAZINE on their desk for EUR 149.00. This also includes access to the online archive with full-search functionality over all published issues.

[www.bioplasticsmagazine.com](http://www.bioplasticsmagazine.com)





### The Roundtable on Sustainable Biomaterials (RSB) is a globally acclaimed certification for bio-based products.

RSB's standard and certification system has been developed by farmers, companies, non-governmental organizations, experts, governments, and inter-governmental agencies. It is globally renowned as the most robust certification system for assuring the sustainability of bio-based products and is an EU approved voluntary sustainability scheme.

Adapted to meet the needs of the emerging bio-economy, RSB certification applies to any bio-product derived from biomass including: bioplastics, cosmetics, biofuel, bioenergy, fibre and lubricants. For details of how to become certified and the tools to implement the RSB's environmental, social and economic principles and criteria see [www.rsb.org](http://www.rsb.org).

"The best-performing scheme ... is the Roundtable on Sustainable Biomaterials (RSB) standard" – WWF\*

#### RSB can help you:

- Prove to your customers worldwide your commitment to sustainability via a scheme supported by global environment and social experts such as WWF and the United Nations Environment Programme
- Demonstrate how your operations benefit the rural economy, biodiversity and reduce greenhouse gas emissions
- Differentiate your business in the market with globally recognized sustainability credentials
- Access unique customers and suppliers who require high environmental and social standards
- Embed energy saving and environmental protection into your operations
- Track feedstock and intermediates along the supply chain
- Carry out greenhouse gas intensity calculations

"[RSB] covers more sustainability criteria, with greater detail, and with more breath in terms of level of assurance [than any other EU-recognized scheme]". – IUCN\*\*

Participation in the ongoing development of the RSB standard and certification system is open to any organization working in a field relevant to biomaterials sustainability. For more information: [www.rsb.org](http://www.rsb.org).

#### Sources:

\*WWF Analysis: Searching for Sustainability – Comparative analysis of certification schemes for biomass used for the production of biofuels.

\*\*IUCN (International Union for the Conservation of Nature): Betting on Best Quality – A Comparison of the Quality and Level of Assurance of Sustainability Standards for Biomass, Soy and Palmoil.



## ROUNDTABLE ON SUSTAINABLE BIOMATERIALS (RSB)

#### Foundation

- 2007

#### Employees

- 7

#### Members

- Over 100 member organizations that include farmers, companies, non-governmental organizations, experts, governments, and inter-governmental agencies concerned with ensuring the sustainability of biomass and biomaterial production and processing.

#### Contact

##### Roundtable on Sustainable Biomaterials (RSB)

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## SKZ – DAS KUNSTSTOFF- ZENTRUM

### Foundation

- 1961

### Turnover

- 27.5 million €

### Employees

- 308

### Branches

- Partner to the plastics industry

### Key products/services

- Testing and Certification of materials and products
- Basic and advanced training of professionals
- Research and Development (materials, processing, testing, joining, environmental impact)
- Certification of management systems



## Das Kunststoff-Zentrum

### Company

SKZ started more than 50 years ago at a time when polymers had been discovered as materials for the future. As today's biggest institute working on plastics in Germany, SKZ offers practical solutions dedicated to meet your needs.

- The research and development is focused on the entire production chain, starting with material development, through processing and joining, to the evaluation of component properties and sustainability.
- SKZ supports your product policy and provides valuable aspects for your markets by means of quality testing, quality inspection and certification.
- With more than 11 000 participants a year SKZ is the European market leader in education, professional training and knowledge transfer in the field of plastics.
- By certifying management systems SKZ promotes high efficiency and economic success of your company.

For several years now, SKZ has been working on the topic biopolymers. Here are some of the relevant subjects:

### Biopolymers

The synthesis of new biopolymers is not always necessary, because already known and available biopolymers can be optimized sufficiently, for example by addition of different additives or fillers. Beside raw material selection and formulation development, our focus lies on the development and optimization of necessary process technologies as well as on the production and characterization of materials and parts according to national and international standards. For these purposes there is a wide range of state-of-the-art compounding and extrusion equipment available in SKZ, such as single screws, co- and counter-rotating twin screws, planetary roller, Buss kneader or ring extruder. Besides this, the complete understanding of all technical relationships and interactions around the injection moulding of biopolymers was achieved (e.g. in the field of hot runner systems). For this, there are two modern pilot plants with a total of five injection moulding machines including an injection moulding compounder available. Main topics particularly deal with part development, tool technology, process optimization and quality assurance.

### Wood Polymer Composites

For more than ten years SKZ research and development division has been working on Wood Polymer Composites (WPC). The influence of formulation and processing parameters on properties of WPC has been studied extensively. It was also analysed how different processing techniques (direct extrusion, extrusion from compounds and injection moulding) influence the properties of WPC with a similar composition. In addition, joining as well as long-term tests such as weathering of WPC were performed.



# SKZ

## Das Kunststoff-Zentrum

### Testing

To distinguish between biobased and conventional plastics, the amount of radioactive carbon isotope  $^{14}\text{C}$  has to be detected. Since last year SKZ can offer in cooperation the determination of  $^{14}\text{C}$  by Accelerator Mass Spectrometry. This method is described in standard ASTM D 6866 and gives a precise ratio of the carbon-isotopes, which defines the biobased content of a product. In addition, the following tests can be performed in the certified SKZ – laboratories:

- Test methods for characterisation of WPC products according to EN 15534-1, -4 and -5
- Tests according to Quality and Testing Specification issued by Quality Association for Wood-based Panels, registered association to achieve a quality mark for terrace deckings (initial type test and third-party supervision)
- Product characteristics and general test methods for WPC according to Önorm B3031; Önorm B3032

Furthermore, SKZ supports companies in order to create and perform testing programs to achieve inspection approvals for statically relevant applications. These tests comprise:

- Tests of material properties, e.g. mechanical and thermal properties, resistance tests
- Tests of product properties, such as water absorption, flexural behavior, long-term resistance, thermal behavior, impact, slip, chemical resistance as well as weathering resistance

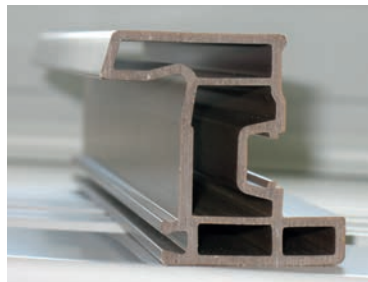
### Sustainability assessment

Biopolymers and WPC are facing particularly high expectations in terms of their sustainability performance. To meet them, it is crucial to have reliable data and comprehensive life cycle analyses for the materials, processes or products. With more than ten years of experience in sustainability assessment SKZ has the competence to provide you with:

- Life Cycle Assessments and Carbon Footprints
- Environmental Product Declarations, EPD, (EN 15804)
- Energy efficiency analyses

### Training and knowledge transfer

Professional training and comprehensive knowledge are individual and company key factors for a successful future. In SKZ's training centres professionals and managers are trained e.g. in the fields of WPC. The seminar „Wood Plastic Composites“ has been conducted once a year since 2007. The event has a workshop character, i.e. topics are discussed intensively with participants in small groups. Experts discuss markets, raw materials, processing and applications of WPC. Besides, the symposium „Processing of Biopolymers“ has been conducted in collaboration with Institute for Bioplastics and Biocomposites from Hannover since 2013. The aim of the conference is to report about current developments and trends regarding the processing of biopolymers.



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## TECNON ORBICHEM LTD

### Foundation

- 1975

### Employees

- 50+ staff of 15 nationalities working in 12 countries

### Key materials

- Bio-based Chemicals
- Bio-Polymers
- Bulk Chemicals
- Chemical Intermediates
- Petrochemicals
- Plastics
- Resins
- Synthetic Fibres

### Key services

- Monthly Market Monitoring
- Supply and Demand Database
- Consulting

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Tecnon OrbiChem's Bio-Materials and Intermediates Chemical Business Focus is a new ground-breaking monthly newsletter service, which was launched in September 2013.

The service offers a detailed and comprehensive coverage of markets, prices and developments for bio-based chemicals and bio-polymers, alongside that for their petrochemical equivalents. It also covers oleo-chemicals in the same report.

Product areas covered monthly, along with price assessments where available, include:

- ETHYLENE & POLYETHYLENE
- GLYCOLS
- POLYETHYLENE TEREPHTHALATE (PET)
- POLYAMIDES & INTERMEDIATES
- BUTANOLS
- EPICHLOROHYDRIN
- BUTANEDIOLS
- SUCCINIC ACID
- POLYOLS
- FATTY ACIDS
- FATTY ALCOHOLS
- GLYCEROL
- POLYLACTIC ACID (PLA)

Our extensive coverage also includes Industry News as well as Economic News and Agricultural Feedstock News affecting the Bio-Materials markets.

In addition, each month, there is a new Chemical Profile, which offers a comprehensive yet compact summary of the market for a particular chemical – in both its petro-chemical and bio-chemical form.

Subscription to the Bio-Materials service includes online access to price histories, charts and trade data, as well as the reports themselves, which are produced in full colour, can be read on-screen or printed out, and are easily navigated using menus and internal hyperlinks.

Many thanks to our partners, who will distribute the iBIB in their networks



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(Denmark)



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The Bioeconomy Consultants

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(Germany)









## WPC-INNOVATION AWARDS | 2007 – 2013

The nova-Institute ([www.nova-institut.eu](http://www.nova-institut.eu)) honours leading innovations in the WPC Industry with its Innovation Award during congresses. The winners of the years 2007 to 2013 were:

### WPC-Innovation Award 2007

Awarded at the Second German WPC-Conference ([www.wpc-kongress.de/wpc07](http://www.wpc-kongress.de/wpc07)) 4–5 December 2007 in Cologne, Germany. The award was sponsored by Reifenhäuser GmbH & Co. KG Maschinenfabrik (Troisdorf, Germany). [www.reifenhauser.com](http://www.reifenhauser.com)

#### Category: Product



**1** Extruded shelf from WPC with patented compression fittings: **mehrerwerk designlabor (Germany)**. A very light shelf of wood chambers with typical woodlike appearance and feel. [www.mehrerwerkdesignlabor.de](http://www.mehrerwerkdesignlabor.de)



**2** terraZa: **SQUARE-SHAPED, DURABLE, PRACTICAL: WERZALIT GmbH + Co. KG (Germany)**. WPC injection molding flooring for outdoor use with a patented click system which can be laid safely and quickly. [www.werzalit.de](http://www.werzalit.de)



**3** Flexible interior composite wood: **Wacker Polymer Systems GmbH & Co. KG (Germany)**. The natural wood colour image is preserved due to the low-temperature processing. The bending properties can be adjusted to the range of “stable” to “flexible”. [www.wacker.com](http://www.wacker.com)

#### Category: Procedure



**1** Linear vibration welding for the creation of Fibrex™-links in window-making: **Fentech AG (Switzerland)**. By the linear motion of two parallel joining areas and the effect of pressure, heat is generated in the joint zone (principle: rub your hands together). The bonding materials melt. After cooling of the thermoplastic materials, a force-fit connection is created. [www.fentech.ch](http://www.fentech.ch)



**2** Recipe and method of production of WPC from residues of furniture production: **Reinü-Fefa Produktions GmbH (Germany)**. Milling dust from the cutting MDF-machining is processed into various types of WPC compounds and final products such as decks, panels – technical level of properties similar to talc filled standard plastics. [www.fefa.de](http://www.fefa.de)



**3** Coloured WPC in a rotary sintering process: **PHK-Polymer GmbH (Germany)**. The rotary sintering process “Rotowood” can now allow you not only to process hardwood, but also softwood. Different coloured wood particles lead to new design possibilities. [www.phk-polymertechnik.de](http://www.phk-polymertechnik.de)

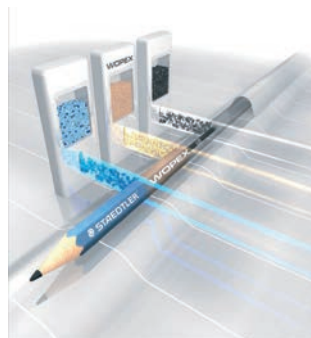
### WPC-Innovation Award 2009

Awarded at the Third German WPC-Conference ([www.wpc-kongress.de/wpc2009](http://www.wpc-kongress.de/wpc2009)), 2–3 December 2009 in Cologne, Germany. The Innovation Award was sponsored by Reifenhäuser GmbH & Co. KG Maschinenfabrik (Troisdorf, Germany). [www.reifenhäuser.com](http://www.reifenhäuser.com)



#### Pencil made of WPC WOPEX® (Wood Pencil Extrusion): Staedtler Mars & Co. KG (Germany).

The WOPEX pencil shaft is made from a wood plastic composite (WOPEX WPC) with a wood content of 70 %. The material consists of fine wood fibre from PEFC-certified German saw mill residue. The pencil lead is made up of appropriate graphites with the addition of very brittle plastics and stearates (soaps) instead of the conventional mixture fired from clay and graphite. Compared to the production of conventional pencils, the production process is much shorter. In addition, the use of wood as a raw material is much more efficient (for conventional pencils the wood waste is up to 80 %) and less energy is required. There are also many benefits for customers: the look and feel is of a high-quality, the writing flow of the pen has a waxy glide which leaves almost no particle residue on the page. Furthermore, it lasts almost twice as long as comparable wood-cased pencils. [www.staedtler.de](http://www.staedtler.de)



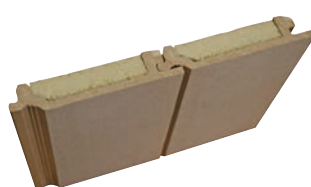
#### Profiles made of Hiendl NFC®: H. Hiendl GmbH & Co. KG (Germany).

As an alternative to standard metal profiles H. Hiendl GmbH & Co. KG offers a variety of assembly profile systems that are made from the composite material Hiendl NFC® with a wood content of 70 %. In comparison to conventional metal systems, the profiles of Hiendl can be continuously extruded in colour. Because of the high-quality composite material and the greater thickness of the material in comparison to metal profiles, the Hiendl profiles are as robust as conventional solutions. They are compatible with conventional systems and are lower-priced than aluminum profiles. [www.hiendl.de](http://www.hiendl.de)



#### WPC thermal insulated siding: Qingdao HuaSheng Hi-tech Development Co. Ltd (China).

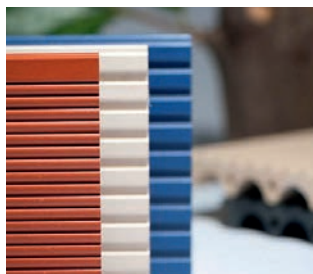
WPC-facing elements: Biofibres based on macromolecule interfacing by special processing are compounded with plastics (recycled PP, ABS and PET) to directly extrude this outdoor siding with smooth surface and tenon. Its striking features are its XPS-thermal insulation, its long durability and its water, wind and snow resistance. [www.qdwp.com](http://www.qdwp.com)



### WPC-Innovation Award 2011

Awarded at the Fourth German WPC-Conference ([www.wpc-kongress.de/wpc2011](http://www.wpc-kongress.de/wpc2011)), 13–14 December 2011 in Cologne, Germany. The Innovation Award was sponsored by BASF Color Solutions Germany GmbH.

[www.basf.com](http://www.basf.com)



#### PLEXIGLAS® Wood PMMA-wood composite: Evonik Industries AG (Germany).

Evonik Industries AG has developed a pure PMMA-wood composite in cooperation with Reifenhäuser GmbH & Co. KG. Known for its durability and fibre wetting, PMMA's properties are shown to their full advantage when combined with wood. Thus the new material will take WPCs to a whole new level in terms of weather resistance, colour stability, dimensional stability and technical strength without requiring any additional surface treatment. The first product group to benefit from the new material will be decking that has a specially developed surface structure in various, brilliant colours. Later it will be available as a special WPC moulding compound. [www.evonik.de](http://www.evonik.de)



#### WPC noise protection profile: Möller GmbH & Co. KG (Germany/Poland).

Möller GmbH & Co. KG presents the product of a joint project with the Cracow Academy of Mining and Metallurgy, the University of Bydgoszcz and Möller-Polska z.o.o.: a WPC noise protection profile. The WPC profile components are weather- and salt-resistant, and their simple plug-on system with profile widths of up to 6 cm saves costly and energy-intensive on-site assembly work. The inner damping performance of the WPC material has been put to good use and combined with a specially developed surface design that scatters sound. The noise insulation system is suitable for lining busy streets, but it can also be used as sound-absorbent cladding in industrial plants and as sound-absorbent interior wall panelling. [www.moeller-profilsysteme.de](http://www.moeller-profilsysteme.de)



#### Process technology for in-mould coating of injection-moulded WPC parts: Werzalit GmbH & Co. KG (Germany).

As part of a joint project, the Werzalit GmbH & Co. KG developed a process technology for the single-step, in-mould decoration and backing of genuine wood veneer. Using this method it is possible, for the very first time, to apply a genuine wood veneer to large, 3D heavily warped contours in one single step. The WPC material offers properties such as low shrinking and warping and the company was able to fully exploit these technological advantages. There is no need to pre-form the veneer parts either. A product using this new processing method – a backrest for an office chair – is currently being prepared for market. [www.werzalit.de](http://www.werzalit.de)



### WPC-Innovation Award 2013

Awarded at the Fifth German WPC-Conference ([www.wpc-kongress.de/wpc2013](http://www.wpc-kongress.de/wpc2013)) 10–11 December 2013 in Cologne, Germany. The award was sponsored by BASF Color Solutions Germany GmbH. [www.basf.com](http://www.basf.com)



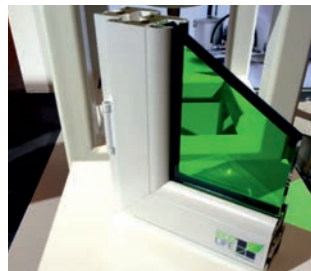
#### RENOLIT GORCELL thermoformable WPC-sheets: RENOLIT SE (Germany).

RENOLIT GORCELL is a thermoplastic lightweight panel with a honeycomb structure and with WPC sheets on the top and the bottom, which give an aesthetical and natural character to the panel in addition of high stability and stiffness. Further strengths are resource and energy efficiency due to the continuous inline-process in manufacture of the panels. A very good thermoformability, easy processability, resistance against water and various chemicals as well as a 100 % recyclability are additional advantages of this new kind of WPC lightweight board. [www.renolit.com](http://www.renolit.com)



#### ECOLIFE® – Planet Protecting Profiles: Kappes Environment Technology Co. Ltd. (KET) (China).

The new WPC window system ECOLIFE® offers an eco-friendly alternative to PVC- and aluminium windows and is made of wood fibres and recycled plastic. The novel combination of a co-extruded WPC profile with a weather-resistant bonding (laminated) of a thin and coloured aluminium band protects the profile from sunlight and rain. For the first time worldwide, a WPC window profile meets all complex technical demands. It was certified by the Chinese Ministry of Housing and Urban-Rural Development in 2012. Market entry of the window will take place in 2014, first in China, then worldwide. Therefore production- and licence partners are looked for. [www.ket-ecolife.com](http://www.ket-ecolife.com)



#### Structural foamed WPC for modular cable manholes: Langmatz GmbH and SKZ KFE gGmbH (Germany).

The new structural foamed WPC for modular cable manholes significantly reduces both the cycle times of production as well as the transport weight and offers easy assembly. Both partners worked together in order to develop a new WPC material that consists to a large extent of renewable resources (45 % wood) and is suitable for the injection moulding of complex, foamed cable manholes with a lower density than the plastic alternatives.

[www.langmatz.de](http://www.langmatz.de) and [www.skz.de](http://www.skz.de)



### Next: WPC-Innovation Award 2015

Please apply: Dr. Asta Eder, Phone: +43 (0) 676 363 14 55  
[asta.eder@nova-institut.de](mailto:asta.eder@nova-institut.de)



## BIO-BASED MATERIAL OF THE YEAR | 2008–2014

### Bio-based Material of the Year 2008

Awarded at the First International Conference of Raw Material Shift & Biomaterials, 3–4 December 2008 in Cologne, Germany. The award was sponsored by Reifenhäuser GmbH & Co. KG Maschinenfabrik (Troisdorf). [www.reifenhauser.com](http://www.reifenhauser.com)



**BIO-PEN: 80% natural ballpoint pen. Overall Winner of the “Bio-based Material of the Year 2008”:** FKUR Kunststoff GmbH & Ritter-Pen GmbH (Germany). The Bio-Pen by Ritter-Pen consists of 80% of Biograde®, a transparent Cellulose acetate made of European softwood. Biograde® not only effectively enables injection moulding but is also easy to print on and colour. [www.fkur.de](http://www.fkur.de) and [www.ritter-pen.de](http://www.ritter-pen.de)



**Wood-free tree product: Men’s shoe in BARKTEX with latex:** Bark Club Cloth Europe (Germany/Uganda). Bark cloth BARKTEX \_Plus-Latex\_059 is a rugged, abrasion-resistant, semi-finished product from the bark of the *Ficus natalensis* (“bark-cloth”), moistened with natural latex of the rubber tree *Hevea brasiliensis*. [www.barktexas.com](http://www.barktexas.com)



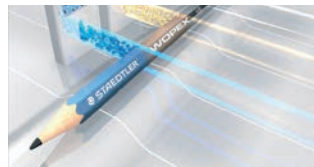
**NABASCO Natural Fiber Composite for sanitary units:** NPSP Composieten BV (The Netherlands). Nabasco (Nature Based Composite) is made from natural fibers such as hemp, flax or sisal with thermosets such as polyester or epoxy resin in the RTM process. Reinforced bio-resins are to be used in the future. Apart from sinks, the material is used in various outdoor applications. [www.npsp.nl](http://www.npsp.nl)

### Bio-based Material of the Year 2009

Awarded at the Second Biomaterials Conference, 26–27 October 2009 in Stuttgart, Germany (at the AVK Annual Meeting): [www.biowerkstoff-kongress.de](http://www.biowerkstoff-kongress.de). The award was sponsored by the machine manufacturer Coperion GmbH (Stuttgart). [www.coperion.com](http://www.coperion.com)



**WOPEX® – WPC-pencil: Staedtler Mars GmbH & Co. KG (Germany).** The pencil shaft is made from a wood-polymer composite (WPC WOPEX) with a wood content of 70 %, which is extruded in a coextrusion together with the graphite core and the tactile soft surfaces. The WPC-pencil also has an increased functionality along with energy and raw materials saving. [www.staedtler.de](http://www.staedtler.de)



**BIOSHRINK® – compostable shrink film: alesco GmbH & Co. KG (Germany).** BIOSHRINK® is the world's first compostable shrink film made from renewable raw materials. BIOSHRINK enables a reliable shrinkage behaviour. [www.alesco.net](http://www.alesco.net)



**Kraftplex® – Wood panel: Well Exhibition Systems GmbH (Germany).** The versatile material Kraftplex® consists of pure wood fiber, but also holds the characteristics of metal, composites and plastics. It is stable, flexible and permanently malleable like metal sheets. [www.well.de](http://www.well.de)



### Bio-based Material of the Year 2009 – Special Award for R&D

**Meriplast®, a rubber type protein-based bioplastic: Tereos-Syral (France/ Belgium).** Meriplast® is a particular new bioplastic: An elastomer made from wheat protein with new completely biodegradable material properties. [www.syral.com](http://www.syral.com)



## Bio-based Material of the Year 2010

Awarded at the Third International Conference on Bio-based Plastics and Composites, 20–21 April 2010 in Hannover, Germany: [www.biowerkstoff-kongress.de](http://www.biowerkstoff-kongress.de). The award was sponsored by the compounding system manufacturer Coperion GmbH (Stuttgart, Germany). [www.coperion.com](http://www.coperion.com)



### PROGANIC® – Watering Can: Proper GmbH & Co. KG

(Germany). The 100 % natural material PROGANIC® is based on three main ingredients: Polyhydroxyalkanoate (PHA), Carnauba Wax and a natural mineral filler. Polyhydroxyalkanoate (PHA) is a biopolymer that is made from bacteria. It can break down naturally and be digested by micro-organisms and is therefore biodegradable. PHA has the same qualities as common plastics but is made from renewable raw materials such as sugar from crops instead of finite natural resources.

[www.proganic.de](http://www.proganic.de)



### GreenGran Natural Fibre Reinforced Granules for Injection

Moulding – Bio-Charger: GreenGran B.V. (The Netherlands/ China). GreenGran's granules are made from a combination of

sustainable and renewable natural plant fibres (such as flax, jute, hemp and keanf) and polypropylene, thus reducing the use of petroleum products. Five times stiffer and 2.5 times stronger than polypropylene, they will not wear and tear the screw and the mould during the processing as glass fibres do. Unlike glass fibres, they do not pose safety and health risks and generally show a better energy and CO<sub>2</sub>-balance. [www.greengran.com](http://www.greengran.com)



### Arctic (based on PLA) – ECOMfort Correction Roller: Henkel AG & Co. KGaA (Germany)

The newly developed and innovative natural 'Arctic' material sets new standards by replacing a highly technical performance plastic with a sustainable renewable material. The new Pritt ECOMfort is the first Correction Roller in the world made from approx. 89 % natural plastic (device shells, excluding usable material such as correction tape & inner parts). This results in approximately 60 % less CO<sub>2</sub> emissions, compared to a roller made from standard plastic, in terms of the whole lifecycle from production (incl. transportation) until waste disposal (same method e.g. recycling).

[www.henkel.de](http://www.henkel.de)

## Bio-based Material of the Year 2011

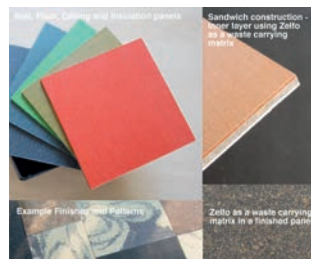
Awarded at the Fourth International Conference on Bio-based Plastics and Composites, 15–16 March 2011 in Cologne, Germany: [www.biowerkstoff-kongress.de](http://www.biowerkstoff-kongress.de). The award was sponsored by the compounding system manufacturer Coperion GmbH (Stuttgart, Germany). [www.coperion.com](http://www.coperion.com)



**Zelfo® – OMODO® GmbH (Germany).** The „Cellulose Optimization Resource Efficient (CORE)“ technology up-cycles cellulosic and ligno-cellulosic waste without the addition of any chemicals, catalysts or binders to create Zelfo®, a micro and nano-fibrillated cellulose fibre (MFC/NFC). Zelfo® can be formed into finished objects (bio-composites) or used as a bio-additive to improve plastic or paper material characteristics.

Feedstock: Cellulose and ligno-cellulose biomass.

[www.omodo.org](http://www.omodo.org) and [www.zelfo-technology.com](http://www.zelfo-technology.com)



**EcoCradle™ – Ecovative Design, LLC (USA).** EcoCradle is a low embodied-energy, compostable, protective packaging material that is literally grown into any custom shape and competes with petrochemical foams in terms of both performance and cost. The self-assembling bonds formed by mycelium (mushroom “roots”) produce this material as it grows around a substrate of regionally sourced agricultural byproducts.

Biomass: Agricultural byproducts, fungus mycelium

[www.ecovatedesign.com](http://www.ecovatedesign.com)



**GAÏALEASE® – ROQUETTE (France).** GAÏALEASE® is a new „high-performance“ range of bio-based plastics for packaging, which can compete in performance terms (mechanical, thermal, soft touch, etc.) with fossil-based plastics. GAÏALEASE® resin is for lasting applications that usually use polyolefins, ABS and more technical polymers – with an excellent cost/efficiency profile.

[www.gaialene.com](http://www.gaialene.com)





## Bio-based Material of the Year 2012

Awarded at the Fifth International Conference on Bio-based Plastics and Composites & Industrial Biotechnology, 14–15 March 2012 in Cologne, Germany: [www.biowerkstoff-kongress.de](http://www.biowerkstoff-kongress.de). The award was sponsored by the compounding system manufacturer Coperion GmbH (Stuttgart, Germany). [www.coperion.com](http://www.coperion.com)



**Fibre mouldings made from cattail (*Typha*) – NAPORO GmbH (Germany).** Robert Schwenmer, Managing Director of NAPORO GmbH from Braunau am Inn in Austria, gave an enthusiastic presentation that won over the expert audience. NAPORO manufactures low-density fibre mouldings for various uses from the little-used cattail (*Typha*). The binding process works through the NAPORO 'NATglue' technology, whereby waxes and oils derived from the marsh plant are activated as binding agent. Cattail (*Typha*) is a wild plant that grows to heights of up to 4 metres, forms large, highly resistant clumps in wetlands and can be managed sustainably. NAPORO foresees that this new kind of fibre moulding will be used in the building and furniture industries, as well as for housings and later in the automobile industry. The first products have already been launched on the market. [www.naporo.com](http://www.naporo.com)



**'spielstabil bioline' toy range made from modified PLA – Martin Fuchs Spielwaren GmbH & Co. KG (Germany).** Second prize went to the company Martin Fuchs Spielwaren GmbH & Co. KG from Zimndorf with their children's toys made from modified PLA. This new development was presented by Martin Vollet (Martin Fuchs Spielwaren) and Cord Grashorn (Linotech). The basis for the new 'spielstabil bioline' toy range is the newly developed PLA Compound Naturegran PV 6930, 68% of which is derived from renewable resources. The toys have very high material strength and high impact strength. The expert audience was obviously impressed by this joint development between the companies Martin Fuchs Spielwaren, Livemold (injection moulding) and Linotech (developer of the material) and by the many challenges the new material is able to meet in terms of its technical characteristics, the high proportion of biomass, intensive colouring and numerous cases in which it has been approved for toys. Product recycling was also taken into account: customers can return the new toy to the manufacturer at no cost later for the materials to be recycled. [www.martin-fuchs-spielwaren.de](http://www.martin-fuchs-spielwaren.de)



**RE-Y-STONE made from recycled paper with bagasse resin – Resopal GmbH (Germany).** Tanja Schäfer was delighted with third place for Resopal's new RE-Y-Stone material. Basic and decorative paper is bound with a natural resin made from the residues of sugar production (bagasse) to make 'RE-Y-STONE'. After curing, the bio-resin has thermoplastic properties and together with the papers forms a hard, mechanically highly loadable, dimensionally stable sheet with a robust surface. The bio-composite sheet is made entirely from renewable and recycled raw materials. One particularly impressive feature of the product is that the surface can be custom designed to make the material look like slate or wood. It is mainly used in the construction industry (interior fittings) or for furniture. The new material can even be used for interior floors. [www.resopal.de](http://www.resopal.de)

## Bio-based Material of the Year 2013

Awarded at the Sixth International Conference on Industrial Biotechnology and Bio-based Plastics & Composites, 11–12 April 2013 in Cologne, Germany: [www.biowerkstoff-kongress.de](http://www.biowerkstoff-kongress.de). The award was sponsored by the compounding system manufacturer Coperion GmbH (Stuttgart, Germany). [www.coperion.de](http://www.coperion.de)



### Airflex™ (AirCarbon™ resins) – Newlight Technologies (USA).

First prize, Bio-based Material of the Year 2013, was awarded to Newlight Technologies, LLC for its Airflex™ (AirCarbon™) resins. CEO Mark Herrema presented a new kind of high-yield technology chain to produce thermoplastics (PHAs) from greenhouse gases (such as CO<sub>2</sub> and methane). Newlight uses the carbon capture and polymerization technology it has developed and patented to match the performance of a wide range of oil-based plastics while out-competing them on price. If Newlight's technical innovation can be put to wide use, then CO<sub>2</sub>-based PHAs are on the brink of an unexpected and wholly novel breakthrough, according to experts at the conference. Company representatives are already showing considerable interest in Newlight's Airflex™ (AirCarbon™) materials. [www.newlight.com](http://www.newlight.com)



### bio-PA universal UX green plug – fischerwerke GmbH & Co. KG (Germany).

Second prize at the Bio-based Material Innovation Awards went to fischerwerke for its plugs made from renewable materials. Dr Joachim Schätzle, Director of Research and Technology Transfer, presented the bio-PA universal UX green plug – the first plug made from renewable raw materials. The new plug contains bio-based Polyamide from castor oil and has equal or even better performance in terms of load, temperature resistance, long-term behaviour and mechanical properties than the standard universal UX plug. Participants of the conference were impressed by this new bio-based and bio-inspired approach to a mass product such as a plug. They also paid tribute to this family-run market leader's commitment to sustainability and to producing a price-competitive product. [www.fischer.de](http://www.fischer.de)



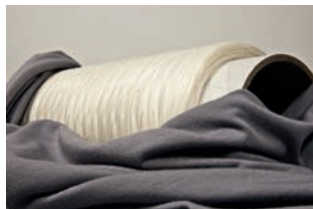
### ajaa! – Sustainable household articles from bioplastics – made in Germany – 4e solutions GmbH & TECNARO GmbH (Germany).

Newcomer ajaa! won over the audience at the conference and was awarded third place in the Innovation Prize. ajaa! is the first manufacturer to offer food storage containers that are manufactured from a special biomaterial made of 100 % renewable resources (sugar), supplemented by minerals and natural waxes, without any crude oil or plasticizers. The product can also be recycled completely. The materials used are sourced locally in southern Germany and are also processed in Germany to limit transport and keep CO<sub>2</sub> emissions low. The audience awarded ajaa! third prize in recognition of a sustainable household product that has all the qualities of a conventional plastic container, i.e. it can be stacked and frozen, is dishwasher-proof and, above all, suitable for storing food. [www.ajaa.de](http://www.ajaa.de)



## Bio-based Material of the Year 2014

Awarded at the Seventh International Conference on Bio-based Materials, 8–10 April 2014 in Cologne, Germany: [www.biowerkstoff-kongress.de](http://www.biowerkstoff-kongress.de). The award was sponsored by the compounding system manufacturer Coperion GmbH (Stuttgart, Germany). [www.coperion.de](http://www.coperion.de)



**Qmilk: The fiber made of milk – Qmilch Deutschland GmbH (Germany).** Qmilk produces a 100 % natural textile fiber based on casein, a milk protein. In spring 2014, the start-up from Hanover began the production of Qmilk fiber for fashion, sportswear and home textiles. The new fiber feels like silk, is compostable, suitable for allergy sufferers, and even antibacterial. The production process takes solely five minutes, demands temperatures of only 80 °C and max. 2 litres of water per kilogram fiber. The raw material is not food but casein from milk that is not suitable for grocery. 2 Mio. tons of waste milk are disposed of in Germany annually. In the future, Qmilk wants to recycle that milk and turn it into fibers. Qmilk also manufactures a bio-based polymer granulate applicable e.g. in automotive interior, toys, foils, and packaging – a zero waste product made in Germany. [www.qmilk.eu](http://www.qmilk.eu)



**FIS Green 300 T: The first bio-based injection mortar – fischerwerke GmbH & Co. KG (Germany).** FIS Green 300 T is the first chemical injection mortar which contains bio-based components. The goal was to innovate a real “green” product which is based on a majority of bio-based raw materials. Chemical injection mortars are complex mixtures consisting of a multitude of different raw materials for each of which green substitutes were examined. As a result, bio-based raw materials with various functions were used: reactive resins, fillers, additives, plasticizers and two different thermoplastic polymers for the cartridge and pistons. This radical product redesign approach made it possible to achieve a high bio carbon content of 50–85 %. FIS Green 300 T demonstrates that it is possible to re-formulate even complex products to make them bio-based and more sustainable. [www.fischer.de](http://www.fischer.de)



**HES-mix: The hemp-based building insulation – Hemp Eco Systems SA (Switzerland).** A building material made from hemp shivs, lime, natural minerals and water. It is used to build walls and insulation in one material and as insulation under roof, attics, walls and floors.

Properties: Highest thermal efficiency; Regulating humidity; Does not burn or rot; 30–50 % reduction of energy in houses and buildings; No toxic chemicals; Offers an alkaline in-door climate; Captures more carbon than is emitted during the complete process; Completely recyclable; Fast & economical application.

Innovation: Exclusive use of hydrated lime, having solved its curing problem with natural minerals as additive; Reduction of the lime content by 50 %, obtaining optimal thermal efficiency and humidity regulation; Developed hydrated lime finishes able to offer a healthy alkaline in-door climate.

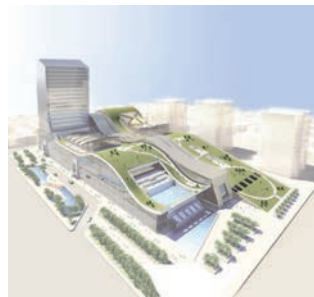
[www.hempecosystems.ch](http://www.hempecosystems.ch)



### Natureline: Green roofing for the 21<sup>st</sup> century – ZinCo GmbH

(Germany). As a pioneer in matters of green roofing, ZinCo

has been consistent in treading the environmental path for over forty years. Providing permanently reliable green roof systems for all types of roof, our top priority is to do so in an environmentally-compatible way. ZinCo system substrates, therefore, are based on recycled, pure-grade clay brick. Where possible, recycling materials are also used for drainage elements and protection mats. ZinCo has now taken yet another innovative step and introduced to the market the system build-up “Natureline”, made from renewable raw materials. Thanks to this, bioplastics (polylactic acid and bio-polyethylene) have now found their way onto the green roof market where they will prove themselves as an alternative with a promising future. [www.zinco.de](http://www.zinco.de)




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### Next: Bio-based Material Award 2015

Please apply: Florence Aeschelmann, Phone: +49 (0) 2233 48 1448, [florence.aeschelmann@nova-institut.de](mailto:florence.aeschelmann@nova-institut.de)

## SUSPACK AWARD 2012

### SusPack 2012 – Conference on sustainable packaging ([www.suspack.eu](http://www.suspack.eu))

During this common event with Anuga FoodTec ([www.anugafoodtec.de](http://www.anugafoodtec.de)), for the first time the nova-Institute offered the „SusPack Award“ for the most innovative and sustainable packaging solution which had their market launch in 2011/2012.



**Paperlid – A more sustainable yoghurt pot lid – Constantia Flexibles GmbH (Austria).** The Paperlid developed by Constantia Flexibles is a three-ply, aluminium-free punched card containing a high proportion of FSC-certified paper. The heat seal lacquer makes it possible to apply a peel-off seal to standard PS and PP pots as well as PLA pots. Paperlid's striking features are its far smaller carbon footprint than conventional aluminium or plastic lids, its high puncture and tear resistance, its metal detector compatibility thanks to its metal-free composition and the ability to work on standard production lines. It also has high barrier performance, good printability and a papery feel that leads to an appealing touch and look. The product proved a hit with the expert audience. [www.constantia-flexibles.com](http://www.constantia-flexibles.com)

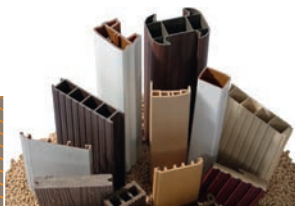


**Tipack – Nature will not even notice we were here – tipa-corp Ltd (Israel).** TIPA has developed revolutionary patent-pending biodegradable blends for the production of packaging solutions for liquids and food. TIPA's flexible pouches are cost competitive, as production processes are optimized for using less raw materials and less heat-energy consumption. With Tipack, a 1-liter 4-pack with varying beverage content per pouch, it has developed a unique family pack ideal for outdoor activities. [www.tipa-corp.com](http://www.tipa-corp.com)



**abulbc – Dutch Tulips in Dutch Design – biodegradable packaging – Imperial Ventures B.V. (The Netherlands).** Imperial Ventures has developed packaging for tulip bulbs that makes full use of the possibilities offered by bio-based and biodegradable plastics as well as having an attractive design. This makes it easy to present homogeneous and clean batches of bulbs for sale, as well as allowing bulbs to be planted in their packaging. The packaging decomposes in the soil, ensuring it does not impede the plant's growth. [www.abulbc.nl](http://www.abulbc.nl)





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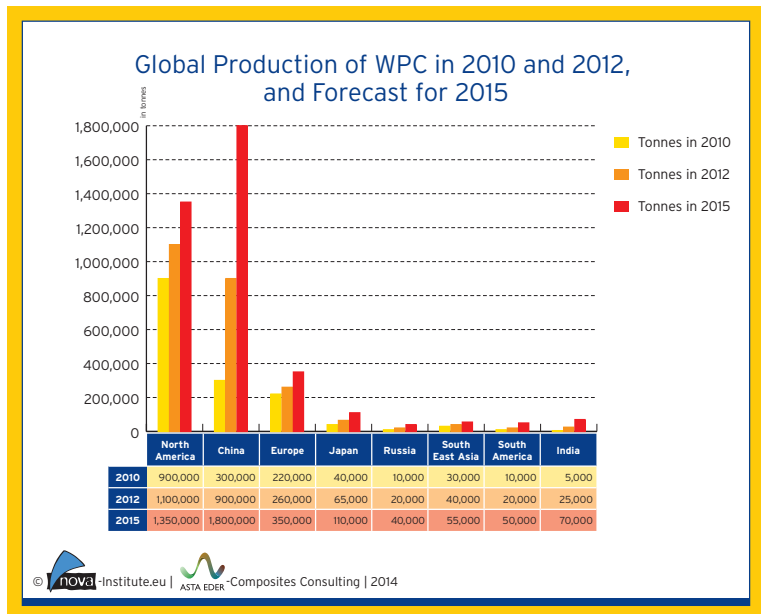
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# Wood-Plastic Composites (WPC) and Natural Fibre Composites (NFC): European and Global Markets 2012 and Future Trends

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