Thermoforming …
… at one with nature.

IDEAS. MOULDS. SOLUTIONS.
From the idea to series product ...  
... competence and full service in thermoforming.

**KNOWLEDGE** as strategy.

As one of the leading companies in the field of thermoforming, we stand for product innovation and continual market development. Decades of experience in the manufacture of high-quality and precision thermoformed parts guarantee reliability and perfection in the product development stage. Our complete competence makes us a strong partner in many areas: product development, industrial design, engineering, construction, creation of prototypes in toolmaking, automation, logistics.

**INNOVATION** as a head start.

In times of high product density and intensive competition, having a head start is important. “Being one step ahead” means a bigger share of the market and additional advantages in position. With creative developments and engineering at the highest level, we provide clever ideas with added value and help you to find contemporary solutions. A high degree of flexibility, our proximity to our customers, whose special applications and product requirements make us partners in the brainstorming and dialogue processes – even in the earliest stage of development.

**COMMITMENT** as a matter of principle.

To ensure this corporate dynamic, we consider ourselves responsible for fair and cooperative dealing with our employees, partners and society as a whole. Our aim is to create sustainable structures within the company to promote new, creative and socially-responsible thinking. We would like to further develop activities with customers, partners and suppliers, incorporating employees, society and the environment to a high degree. With this claim, we are in the position not only to fulfil the expectations of our customers, but also to exceed them.

**SUSTAINABILITY** as a chance.

An ecological mindset to secure the future characterises society and industry equally. The need for sustainable and ecologically-sound materials is increasing in all sectors. As an aim of extensive research and development work, it is now possible to use biodegradable materials for thermo-forming procedures. As a result, after months of test series, we are now in the position to realise the visions of our customers and create a further piece of security for nature and the environment.

**OUR SERVICE PORTFOLIO:**

- Prototype and model production
- Industrial design and construction
- Tool and equipment construction
- Technical components and systems
- Moulded parts in renewable and biodegradable materials
- Industrial containers and packaging

**OUR PRINCIPLES:**

- Competence and efficiency
- Innovation and vision
- Dynamics and flexibility
- Confidence and reliability
- Sustainability and responsibility
- Quality and functionality
Against the background of the ever decreasing supplies of fossil resources, alternative materials are increasingly becoming the focus of the industry. The use of materials created on the basis of renewable resources are considered a pioneering development, especially for the processors of popular crude oil-based plastics. For this reason, the replacement of fossil resources by renewable ones is at the forefront of our active research and development work.

**SUSTAINABILITY** through ecological production factors.

Today for tomorrow … … taking chances to design the future.

**CREATING** the future through new solutions.

Sustainably produced and biodegradable materials contribute to protecting the climate, offer solutions for the waste problems and make it possible to become independent of fossil resources. As one of the leading manufacturers of thermoformed components, we consider sustainable action to be our obligation: together with research and development, we are promoting the further development of new biodegradable materials, which are produced by alternative methods.

A **HEAD START** through action.

With our decades of experience, technical knowledge and intensive research and development in the field of thermoforming and materials, we are a step ahead. Even today, we are in the position to replace all existing thermoformed parts, which were previously manufactured of plastics based on crude oil, with thermoformed components with environmentally-friendly materials! It goes without saying that this is completely without having to forego the advantages of conventional thermoplastic materials.

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**BIO** is not the same as bio.

The term “bioplastic” includes an entire array of materials with a huge range of properties. The association for the European bioplastic industry “European Bioplastics” describes the materials as either bio-based, biodegradable or both.

**Bio-based plastics** are manufactured from biomass or plants.

**Biodegradable plastics** are subject to a chemical process, known as biodegradability. In connection with naturally occurring microorganisms, bioplastic is converted into natural substances such as water, nitrogen and compost. In detail, this process is dependent on the material used, as well as the prevailing local conditions (humidity, temperature, etc.).

Bio-based is not the same as biodegradable. The chemical structure of a material is decisive for the biodegradability: materials, which are 100 % bio-based, are not forced to be biodegradable – likewise, fossil materials (made of finite resources) can on the other hand be biodegradable.

### Bioplastics ... ... properties and advantages.

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The **advantages of bioplastics**.

The demand for biological materials is increasing continually, as bioplastics have decisive advantages in comparison to conventional plastics:

- **The efficient use of renewable resources.** The plants used normally grow within one year and can be used both for material production and the subsequent generation of biomass (cascade use).
- **The CO$_2$ footprint is reduced, greenhouse gases are lowered.**
- **The saving and successive replacement of fossil resources.**
Biomaterials ... … ecologically sustainable with the properties of plastic.

**CREATION OF VALUE** at one with the environment.

For us, sustainability is the design of a long-lasting, sustainable development of the economic, ecological and social dimension of human existence. Or put in simple terms: we, as a company, are responsible for ensuring that the subsequent generations are able to live together with nature and the environment. Up to now, the manufacture of all conventional thermoplasts has been based on a finite fossil resource: crude oil. This finite resource must not be replaced by an alternative, equally finite resource.

The manufacture of future thermoplasts must take place on the basis of a new, sustainable value added chain, so that the future generations can also benefit from the advantages of polymer materials.

**QUALITY** begins in the production process.

In cooperation with leading specialists of biopolymer research, we have developed materials based on regenerative and fossil materials.

The material contributes greatly to the conservation and efficiency of resources, as it is made of renewable resources. In comparison to crude oil-based thermoplasts, the base material is largely CO₂-neutral, as it only emits the quantity of CO₂ into the environment, which was absorbed by the renewable resource during its growth stage. The material is biodegradable. This means that it is decomposed by microorganisms such as bacteria and fungi in suitable environmental conditions (temperature, air humidity, pH value). This creates end products such as water, humus and carbon dioxide.

Substitution ... ... as a step into the future.

**PRO-ECO** as a statement of modern production.

The automotive industry is the trailblazer: the use of environmentally-friendly technology is at the forefront, especially in terms of vehicle construction. State-of-the-art electronic systems ensure the reduction of pollutants and conserve resources in the field of mobility.

The consistent extrapolation of ecologically-aware production processes are sustainability and the use of biodegradable materials in the assembly of vehicles. In automation engineering, for example, workpiece carriers take on a decisive role. Customised solutions are being developed for custom-fit product reception, which guarantee a flawless process. In the circuit of environmentally-friendly production processes, automation trays are increasingly used. These are produced from the biodegradable and sustainable material. The increase in ecological prestige projects is accelerating the replacement of conventional trays for material carriers made of renewable resources. Process chains are gradually becoming more environmentally-friendly through this substitution process by the manufacturers, conserving resources in the long-term.

**Sustainability processes of the manufacturing industry are increasingly leading to the replacement of conventionally produced material carriers for environmentally-friendly materials.**

Our pioneering work in this market segment has been subsidised by the Federal Ministry of Economics and Technology on the basis of a ruling by the German Federal Parliament.
Type B2S bioplastics … … convincing in terms of quality and flexibility.

**THE TOP PERFORMER** among bioplastics.

B2S (biodegradable to soil) is a biodegradable material with a regenerative resource proportion of 80%. Among other things, B2S is based on natural fatty acids, natural resins, cellulose and starch.

The material is completely biodegradable and is similar in its mechanical properties to impact-resistant plastics, such as ABS. Even in terms of its appearance, B2S cannot be differentiated from a conventional crude oil-based plastic such as ABS and can be supplied in all conventional colours.

B2S moulded parts can be completely decomposed into water, humus and CO₂ by natural microorganisms such as fungi and bacteria, after their useful life is over. By using B2S, CO₂ emissions can be massively reduced in comparison to conventional plastics!

As a colourless base material for further refinement, B2S offers opportunities to individually adapt the colour.

The surface of the sheets is smooth, even and comparable with conventional ABS sheets.

It is virtually impossible to see any difference in the end product in comparison with the use of conventional crude oil-based materials.

COLOUR AND SURFACE DESIGN

The materials can be dyed any colour by adding an additive. Semi-finished sheets can be laminated with decorative films. Formed products can be painted individually.

MATERIAL PROPERTY

Both B2S and B3/SBC are comparable with conventional crude oil-based plastics such as ABS due to their material properties. Depending on the requirements of the application, the material properties can be individually adapted.

UV-RESISTANCE/FLAME PROOFING

The materials are weatherproof and UV-resistant. With the addition of additives, it is possible to guarantee the flame proofing of the material used.

MECHANICAL PROCESSING

On the basis of the above material properties, B2S and B3/SBC are suitable for individual mechanical refinement.

Type B3/SBC bioplastics … … inspired by nature: 100 % biological.

**THE ENVIRONMENTALIST** among bioplastics.

B3/SBC (be three/sustainable biodegradable combustible) is a sustainable, completely biodegradable and combustible material with a 100% regenerative resource proportion. The polymer matrix of B3/SBC consists of lignin, the second most common naturally occurring biopolymer after cellulose. Lignin is a solid biopolymer, which is stored in the cell wall of plants and causes the lignifications of cells as a result. About 30% of the dry matter of lignified plants is made of lignin, which is why it is the most common organic compound on earth apart from cellulose. The total naturally occurring production of lignins is estimated to be about 20 billion tonnes a year! This ensures a virtually endless supply of lignin as a resource, and without influencing the farming of food!

Lignin can even be extracted from tree bark, sawdust and straw!

If you mix lignin with natural fibres such as flax or hemp, then a workable fibrous composite is developed. B3/SBC can be extruded into sheets and processed by us into thermoformed parts – for all intents and purposes, it is “thermoplastic wood”!

B3/SBC can be decomposed by rotting, in exactly the same way as grown wood and can even be disposed of by burning, without producing any additional CO₂!

Tree bark, sawdust and straw can be used as raw materials for lignin.

Combined with natural fibres, the workable fibrous composite B3/SBC is developed as a dark-coloured granulate.

The sheets for the thermoforming process have an even and natural surface structure.

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Woody ... information and signposting system.

**PIONEERING** in material and function.

Woody signs made of B3/SBC provide signposts with an innovative appearance and sustainably preserve the environment. The avoidance of conventional plastic, sheet metal and other artificial materials aids the eco-system and distinguishes operators for their innovation and environmental protection.

Woody information and signposting systems stand for 100 % sustainable production and completely biodegradable material.

It goes without saying that the system is available in individual shapes and colours.

MAXIMUM QUALITY AT ONE WITH NATURE:

- 100 % biodegradable
- Made from renewable resources
- Flexible in form, colour and function
- Resistant to atmospheric influences
- UV-resistant
- So that nature stays pure

Exemplary ... forest information system of the Bavaria State Forest Enterprise.

To protect the forest.

The forest information system of the Bavaria State Forest Enterprise provides visitors with clear information about important issues about forestry and describes these in detail.

In contrast to the original plan of producing the signage system from wood, all boards were made from B3/SBC. The production from 100 % regenerative materials and the complete biodegradability as part of the eco-system was ultimately consistent with the philosophy and ecological task of the Bavaria State Forest Enterprise.

This allowed the use of valuable wood to be substituted, so that it can now be used elsewhere. The Woody forest signs provide the forest information system with an innovative appearance, which fits directly with the “forest” theme.
SoilPOD …
… plant system with integrated water tank.

Clever Planting saves time and money.

SoilPOD is the plant system of the future: the AQUA X-Pro water tank is positioned in the completely biodegradable plant star, which is made from 100% regenerative materials.

The granulate is able to absorb several times its own volume in water and acts as a water reserve for root growth. In economic terms, the system is impressive due to the enormous reduction in all outlays, which were previously used for the journey, employees and watering. Due to the unique storage capacity, SoilPOD is able to save water over longer periods of time. This reduces costs considerably – especially in commercial use. Another advantage of the system is the controlled water and nutrient delivery, which reduces the stress status of the plants.

AQUA X-Pro …
… the catalyst for growth.

Power Pack for water retention and humification.

AQUA X-Pro stores 20-times its volume in water, provides the soil with organic soil additives and ensures natural and rapid humification of the simplest of soils.

SoilPOD is suitable for:
- Gardening, roof greening, tree/plant cultivation
- Public areas: forestry, recultivation
- Greening of arid regions (steppes, deserts, mountains)

Study by the University of Bremen:

Test set-ups by the Center for Environmental Research and Sustainable Technology at the University of Bremen uses the SoilPOD and Aqua X-Pro plant system in various test series. The results of the first test series can be summarised as follows:
- Improved foliage performance*
- Reduced loss of leaves by more than three weeks*
- Improved wood performance*

* without additional watering

Reference Partners:

The Baumschule Renate Müller from Elsterwerda is our partner in the use of SoilPOD and Aqua X-Pro. www.baumschule-elsterwerda.de

The Advantages:
- Increases water storage capacity
- Pre-loaded with nutrients and trace elements
- Starter quality: optimal growing conditions
- Cost reduction due to savings in personnel, time and resources
- Accelerated growth
- No stress state through the constant provision of water
- Can be individually adapted to the plant and soil conditions

Universität Bremen

AQUA X-Pro

SoilPOD top part

AQUA X-Pro

SoilPOD base plate with AQUA X-Pro

AQUA X-Pro in a dry state

AQUA X-Pro after watering
Gaia …
… burial form of the future.

In view of the growing ecological awareness of people, the themes of decomposition and environmental friendliness of casket materials are becoming more and more important.

Gaia caskets decompose and can be cremated with the same properties as conventional wooden caskets.

The difference is that there is no glue or varnishes, which are used for all conventional caskets. The environment-neutral Gaia caskets are cremated with less combustion residue due to the lower proportion of extraneous ash.

The change in how death is dealt with is forcing many industries to rethink: modern funerals, individual ceremonies and personally designed rituals are clear signs of the need of people to say goodbye individually. As a symbol of the final resting place, the casket sums up individuality and self-definition. Gaia caskets can be produced to meet individual requirements and wishes. Away from classic edged and dome shapes, curves and forms can be produced cost-effectively to demand.

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