



The meadow grass fibers are mixed with the plastic granules in the highest possible concentration to minimize the ecological footprint of the end product.

Meadow Grass, Biogas and Bioplastics

An innovative combination for a biogas plant is provided by the production facility of Biwert Industrie GmbH in Brensbach, located in the Odenwald region (Hesse). The company primarily focuses on the production of natural fiber-reinforced plastics, which can contribute to decarbonization.

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The slopes of the Gersprenz Valley in the northern Odenwald region are marked by vast meadows. On the outskirts of Brensbach, there is an innovative factory that processes meadow grass and is powered by one of the largest biogas plants in Hesse, generating electricity and heat. In turn, the biogas plant utilizes the residual materials generated from the grass processing. The concept behind this idea is the “biorefinery”: The company aims to make the plastics industry independent of petroleum by using renewable resources. This could open up a huge market that is likely to gain even

more momentum due to the currently skyrocketing fossil energy prices. However, there is still a lot of pioneering work to be done, and industry giants have not yet shown interest. “We haven’t attracted the attention of the major chemical industry yet,” says Managing Director Jens Meyer zu Drewer during a visit to the site.

Successful Relaunch

The company’s history dates back approximately 15 years. Even back then, its goal was to develop a starting material for thermal insulation materials and plastic products from meadow grass. This led to a small

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Biowert Industrie GmbH in the Odenwald region uses grass as a source material for a whole range of products.

range of products, from spoons to decking, which were also marketed on a small scale. When one of the founders died suddenly in 2019, it was time to make a fresh start.

The company had to be reorganized, discontinuing the distribution of end products and focusing on the industrial customer business. Its new managing director, Jens Meyer zu Drewer, who joined the company in 2021, brought in experience from the plastics processing industry. The company now employs 14 people in Brensbach. “With this, we have achieved a good starting position to further expand the business,” says the managing director. For the past nine months, the company has been gaining momentum: A new production building has been constructed where the main product, a grass-based plastic granulate, is manufactured. An investment of 1.5 million euros was made for this purpose. As a result, the capacity has quadrupled and now produces approximately 400 tons of the AGRIPLAST per year. A further fourfold increase is expected to be achieved in three years.

In the neighboring town of Groß-Bieberau, an exhibition space has been set up to showcase the full range of products made from the grass-based plastic. Customers of the granulate include plastic injection molding manufacturers from all over Germany. One of the first customers is Cortec from Wald-Michelbach, which produces clothes hangers that are used, among other places, in a large drugstore chain. The exhibition also features stackable boxes, in-wall boxes, computer keyboards, and PC mice. Meyer zu Drewer also sees further growth potential in the consumer goods industry, such as in handles for hardware or products from toy manufacturers. However, suppliers to the automotive indus-

try may be even more important: “Pilot series are already underway there, and there is a great deal of interest,” says the managing director. The more important the concept of sustainability becomes, the better the market for such products is expected to perform. The fact that the bioplastic feels more natural and that the fiber structures can still be recognized is increasingly seen as an advantage: “Many designers even say that the grass content has to be visible so that you can experience sustainability,” reports the managing director in sales discussions.

The granules are made from recycled polypropylene, to which varying amounts of grass are added. The base product has a fiber content of 40 percent. For some products, such as decking boards, this can be increased to 75 percent. The polypropylene that is used comes from the medical technology sector, where it has undergone only one processing step and is pure in its composition.

Thus, a pure secondary raw material is used, which – like meadow grass – is “already at the earth’s surface” and helps to gradually reduce the petrochemical footprint. Not only does the mixed plastic have to be pure, it also has to have a certain flowability in order to be optimally processed in injection molding plants. The plastic can also be colored, further expanding its range of applications. Very good rigidity is of great importance in many products, such as tool cases and technical parts.

The bioplastic can be dyed in various colors, which, according to Managing Director Jens Meyer zu Drewer, increases its range of applications.



Potential for a 60% Decrease in CO₂ Emissions

Use of the new product is not only an image factor for plastic producers, it can also be quantified for its contribution to climate protection: Experts report that bioplastic currently enables more than a 60 percent reduction in CO₂ emissions. The recycling material is expected to be sufficiently available for this pur- ▶



Flush-mounted boxes made of bioplastic. The fibers made from meadow grass exemplify the ecological component of the product.



Clothes hangers for the branches of a large German drugstore chain contain the bioplastics from the Odenwald region.

pose. Meyer zu Drewer estimates the plastic market in Germany at 14 to 15 million tons annually, of which the recycling share or material recycling amounts to only about 3 million tons.

The company can produce a wide range of additional products from the grass refining plant and biogas plant. In addition to the plastic made from the grass, marketed under the name AGRIPLAST, it also produces the liquid fertilizer AGRIFER. This fertilizer has an advantage over mineral fertilizers, especially in periods of drought, as it makes the nutrients directly available to the plants. A fiber insulation material, AGRICELL, is supplied to manufacturers of insulation mats. However, it could also be used as loose fill or blown-in insulation.

The Managing Director Jens Meyer zu Drewer (right) and technical co-worker Nils Münch with the plastic granules.

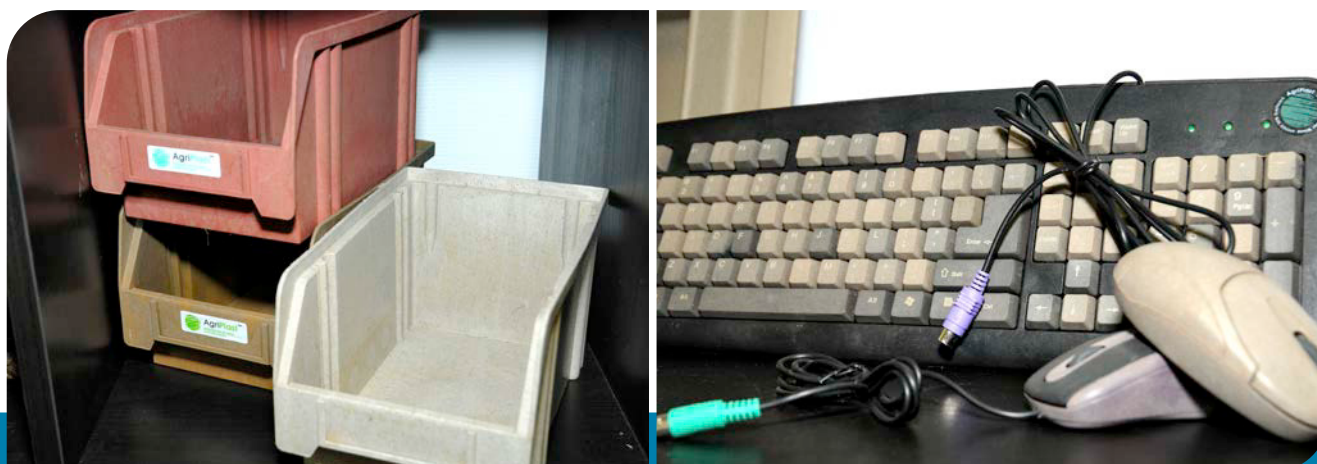


Harvesting Meadow Grass

The company sources the meadow grass from a producer association of farmers in the surrounding area. These farmers cultivate two-year-old ryegrass in rotation on their fields. The dry summers of recent years enable them to make only two cuts, at the end of May and the end of June. Ideally, they would prefer to harvest four times a year. For cellulose fiber extraction, the grass must be free of lignin, meaning it should not be woody. It is delivered to the meadow grass factory in chopped form, placed in the on-site 100-meter-long silo, compacted, and hermetically sealed to allow for fermentation and storage. After four to six weeks, the grass silage can be extracted. “In the future, we also plan to utilize permanent meadow grass as a raw material resource,” Meyer zu Drewer plans.

Processing is done on the principle of breaking the grass down into its individual components: The raw material from the meadow is transferred from the silo to a washing device containing 60-degree centigrade hot water. This process removes impurities such as stones. The cellulose then floats to the top and can be skimmed off. What follows is a multi-stage process in a device called a macerator. The material is rubbed and beaten, thereby breaking it down and transforming it into an airy fiber mass. This process opens up the cell walls, allowing the grass juice to be released, which is ideal as a substrate for the on-site biogas plant. In two drying units, the remaining water is then removed from the fibers.

The part of the cellulose intended for insulation production is already equipped with flame retardants before it is dried, giving it a fire protection rating of class B2. The other part for plastic production is further pulverized, mixed with recycled plastic, and fed into a pellet press. The pellets are then transformed into granules before being packaged in the desired units.



Stacking boxes made of bioplastic.

Whole PC keyboards and PC mouse casings can be manufactured from bioplastic.

Biogas Plant is the Key Component

The biogas plant is the key component of the system and takes up the bulk of the premises of the Biowert factory. It was set up by Hese Biogas GmbH from Gelsenkirchen in as early as 2005. It consists of the receiving hall, a pre-treatment container for the mixing of solid components, the hygienization unit, the digester, a combined storage tank, the combined heat and power plants (CHP), and the digestate processing unit.

The digester is licensed for 70,000 tons of substrate, but according to the managing director, this volume cannot be fully utilized. The substrates or inputs mainly come from the food sector, such as food waste from large-scale kitchens or unsellable food products. In addition, the grass juice from the Biowert factory is used as an accelerator for biogas production. The two CHP plants generate a combined electrical power of 717 kilowatts each, producing up to 9 million kilowatt-hours per year. The generated electricity is used for the company's own power needs, and the surplus is fed into the public grid.

The waste heat from the engine cooling system is directed into a central hot water storage tank, which is connected to both the grass refining factory and the biogas plant. The exhaust heat from the CHP plants is utilized for drying cellulose fibers, hygienization processes, and heating the digester in the biogas plant. The solid digestate serves as valuable fertilizer for farmers' fields, while the liquid phase is processed into a fertilizer product. Ultrafiltration and reverse osmosis are available to obtain a high-quality digestate concentrate.

The Vision of Real Bioplastics

The Managing Director Meyer zu Drewer sees a great deal of potential for the establishment of additional

Biowert facilities. The mixed grass is not a limiting factor, considering the 4.7 million hectares of permanent grassland in Germany. Therefore, it is conceivable to have further locations in areas with a high proportion of grassland, such as the Münsterland, Lower Saxony, or Mecklenburg-Western Pomerania. However, the next technological milestone needs to be achieved before the plant concept is replicated. And that milestone involves replacing recycled plastic with real bioplastics. This would completely eliminate the use of petrochemical ingredients. "We have already submitted a research and development project for this and are now waiting for funding," reports Meyer zu Drewer. He does not go into detail at this point but reveals that they aim to produce plastics from secondary raw materials through biological processes. When will they achieve this? "We expect to achieve the breakthrough in three to five years," Managing Director Meyer zu Drewer estimates. ◀

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