

Modification of the thermoplastically moldable bio-material Arboform allows the rotting process of the burial urns to be influenced

(photos: Alento)

**Biomaterials.** With a burial urn made from the thermoplastically moldable biomaterial Arboform, Alento AG has developed a product made from a renewable raw material. The company has taken the route to a reliable injection molding process for this ephemeral “liquid wood” in close cooperation with a machine manufacturer.

# Reliable Process for Liquid Wood Products

**THOMAS BRETTNICH**

Herbert Perschl, Managing Partner and founder of the Swiss company, Alento AG (see box “BioStruct” on page 35), presents a collection of his urns. “I have been fascinated by thermoplastics made from renewable raw materials since the 1990s when I was working for an automobile manufacturer. Since 2002, we have been carrying out trials with the wood-based material, Arboform, in our own company.” But why urns of all things? “We were looking for an injection moldable product that we could launch quickly and directly onto the market,” explains Perschl. “And the undertakers are increasingly looking for urns made from environmentally friendly materials that rot in contact with microbes. Furthermore, we had the St. Gallen Crematorium as a loyal customer for the product right from the start.”

## Formulations for Different Material Properties

Herbert Perschl spreads out a mixture of Arboform pellets (manufacturer: Tecnar GmbH, Ilsfeld, Germany) on the conference table. “Because we produce liquid wood urns with various material properties from different raw material mixtures, we are able, for example, to control the rotting process. One such example are urns for burial at sea. The material can be formulated such that they decompose in the water within three days. The visually identical original urns take significantly longer, between one and three years, depending on the material and the soil conditions.”

The molding weight of the urns with a capacity of 4.5 l marketed by Alento throughout Europe is around 1 kg. Smaller variants, such as for pets, are in preparation. Compared with commercially available natural material urns, the Alento urn is more dimensionally stable and its surface is visually more attractive. Furthermore, it offers a patented ash-tight closure based on a special sealing contour between vessel and lid which requires no

glue. On request the company can also supply a variant whose lid can no longer be removed from the closed urn, so that the additional ash capsule generally used in Germany could be eliminated.

Alento currently produces around 5,000 liquid wood urns per year with a rising trend. Manfred Zoss, responsible for the company’s sales and financial management, rotates an urn to show the grain. “The surfaces are never identical. Every urn is unique. We achieve even more variety since we have succeeded in also producing white and reddish-brown urns.” Furthermore, the spectrum of the high-quality surfaces ranges from natural colors through green, black and red right up to beige. In addition, the cus-

## Contact

**Sumitomo (SHI) Demag Plastics Machinery GmbH**  
 D-90571 Schwaig  
 Germany  
 TEL +49 911 5061-0  
 → [www.sumitomo-shi-demag.eu](http://www.sumitomo-shi-demag.eu)

Translated from *Kunststoffe* 5/2011, pp. 63–65

Article as PDF-File at [www.kunststoffe-international.com](http://www.kunststoffe-international.com); Document Number: PE110747

tomers has a choice between smooth and patterned or engraved surfaces. Coating with clear lacquer is not necessary. Herbert Perschl places two urn lids on the table. He taps them and tries to bend the edges. "Depending on the formulation, the material can be more flexible, stronger or more rigid and can have a high elongation at break."

### Evanescence as a Crucial Criterion

The biomaterial from which Alento produces the urns can be processed in the same way as a thermoplastic polymer.



**Urs Kocher from the Swiss agents of Sumitomo (SHI) Demag, and Herbert Perschl and Manfred Zoss, both Alento AG (from left to right), expect an attractive market for products made from the biomaterial Arboform** (photo: Sumitomo (SHI) Demag)

Perschl holds a finish molding for the interior outfitting of a motor vehicle in his hand. "Arboform can also be used as a substrate for fine wood veneers, as it meets the high thermal demands with respect to the maximum temperature fluctuations occurring inside the motor vehicle."

The material is predominantly produced from the wood constituents lignin and cellulose, and consequently from 100 % renewable resources. 50 million tonnes of the cell wall material lignin are left over every year as residues from paper production. Tecnaro, the developer and producer of Arboform, adds cellulose and other natural fibers such as flax or hemp together with natural additives to the lignin powders. The wood-brown mixture that is generally artificially pigmented is then pressed into a pea-sized pellet.

Arboform, more resistant than wood and freely moldable, is just waiting for the developers' ideas. Herbert Perschl takes a shoe tree from the cupboard. "This product ensures that the shoe stays in shape. At the same time it dispels moisture."



**Alento produces liquid wood urns and other bioproducts from a variety of raw material mixtures**

Since the material is won from regenerative resources, it is completely pollutant-free, biologically degradable, compostable and recyclable. And by contrast with other biomaterials, it requires no starch derivatives. Alento rejects their use in plastic products for ethical reasons, particu-

Herbert Perschl turned to Sumitomo (SHI) Demag Plastics Machinery GmbH, Schwaig, Germany. "We have built up our know-how over three years of close cooperation with the special departments at Demag and have developed it to our core competence." Even today, the two companies form teams when it comes to application-specific modification or optimization of the process.

Arboform is injected into a mold at a pressure of 1,000 bar and a temperature of between 110 and 170 °C. "Because the material requires moisture for plasticizing, thus distinguishing it from other natural fiber injection molding pellets, it does not have to be dried before processing – despite its hydrophilic character," explains Urs Kocher, consultant and sales manager of Mapag Maschinen AG, Berne, the Sumitomo (SHI) Demag agent in Switzerland. "Furthermore, roughly 30 % less energy is required than for conventional plastics as the temperature profile of Arboform is significantly lower."

During the tour of the workshop, Perschl stops in front of a machine. "The main challenge was to be able to process →

### ! "BioStruct"

For **Alento AG** from Widnau, Switzerland, founded in 2005, the development and production of both plastic products and natural material products from liquid wood belongs to their core competences. Alento is also one of 20 partners from ten European countries participating in the **BioStruct joint research project** with a total budget of around EUR 10 million funded by the European Commission. The goal is to develop the next generation of wood and cellulose fiber-reinforced composites called "enhanced wood plastic composites (eWPCs)". Alento is responsible here for the field of application development and industrial case examples. At present the project is in the case study phase during which i.a. interior outfitting components for the automotive industry with between 90 and 100 % biomaterial are being produced.

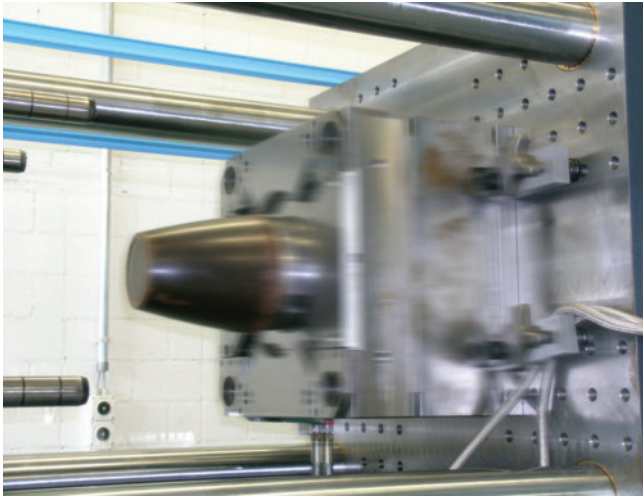
**www.alento.ch**

larly as the starch won from plants is a foodstuff. Furthermore, speculators drive up the price for starches because they are also required for the production of bio-fuel. Arboform even leaves less waste than solid wood.

For Alento this evanescence is a crucial criterion. Manfred Zoss passes round rope fixators. "They allow ropes to be fixed to wooden posts as temporary barriers, for example, that later rot together with the posts." As with a combustion process, Arboform thereby releases only the quantities of CO<sub>2</sub> that the plants have bound from the atmosphere during their growth. In addition, the material consumes no petrochemical resources – by contrast with conventional polymers. The extremely high and consistent quality of the material derives from the lignin in its matrix.

### Modified Temperature Profile with Low Energy Consumption

When the question of a reliable injection molding process for Arboform arose,



Alento has developed the reliable injection molding process for Arboform in three years of close cooperation with Sumitomo (SHI) Demag



The shoe tree made from the biomaterial keeps the shoe in shape and at the same time dispels moisture

natural fibers on standard injection molding machines. Demag has designed a Systec 200-1450 universal machine with 2,000 kN mold clamping force for all similar types of material available on the market.” For example, the injection profile (by changing the injection speed and pressure) and the temperature profile were modified. Furthermore, the process engineers have defined which material-specific properties have to be taken into consideration during the mold production, and how the process is to be adapted to the percentage of fibers and the product. In line with the material properties, the process demands e.g. improved venting of the mold.

The avoidance of thermal damage to the delicate biomaterial presupposes gentle treatment during melting in the plasticizing cylinder. A screw geometry adapted to these demands, i. a.

- a long compression zone with modified compression,
- a special non-return valve, and

- surface coating to prevent corrosion and deposits,

ensures a consistently high melt quality. Perschl continues: “The scrap rate at the start of the project was 80 %, in the meantime we have brought it down to less than 1 %. And the development is by no means at an end. This is reflected in the fact that we can now inject Arboform behind biofilms.”

### Market Success just a Question of Time

At 4.50 EUR/kg Arboform is more expensive than bulk plastics, but far less expensive than a high-performance plastic that currently costs between 6 and 20 EUR/kg. According to market studies it is only a question of time before Arboform and similar materials establish themselves, not least because of the fact that the price can be expected to drop with growing production volumes over the course of the coming years and the costs are unrelated

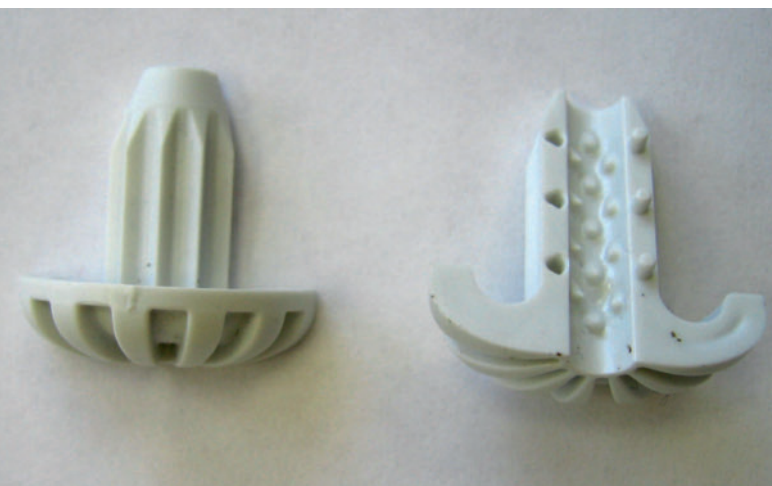
to the price of crude oil. Furthermore, more and more customers are increasingly bringing the sustainability of a material to the forefront of their marketing strategies.

Manfred Zoss regards the market prospects for the burial urns optimistically: “We have already reached the marginal return for the development of the urns. And that without subsidies. In view of some 500,000 cremations a year in Germany alone, there is an interesting perspective here. We contact crematoria and local authorities directly and try to arouse their interest.” For example, the interest of the city of Nuremberg. The decision-takers there have done their math. If they use Alento urns in their crematorium, they do not have to dig out anything after the end of the peace of the dead and could therefore significantly cut their costs.

Furthermore, Alento is supported in the search for new applications and markets by the University of St. Gallen, Switzerland. Perspectives are also opening up for other materials from Tecnar, such as Arboblend that in its mechanical property profile is comparable with that of impact-resistant plastics and is made from renewable resources. The latest member of the product family is Arbo-phonie. Herbert Perschl shows a mouthpiece of a flute made from the acoustically optimized material. There are therefore also some very lively applications. ■

### THE AUTHOR

DIPL.-ING. (FH) THOMAS BRETTNICH, born in 1979, is Head of Technology Development at Sumitomo (SHI) Demag Plastics Machinery GmbH, Schwaig, Germany.



The part fixes ropes e.g. to wooden posts and later rots together with the posts