Cremation urn made from Arboform (Photo: Alento AG)

Think Tank Advocates Renewable Plastic

Reliable Injection Moulding Process for 'Liquid Wood' Products

With a cremation urn made from the thermoplastic biomaterial ARBOFORM Alento AG of Widnau, Switzerland, has developed a product made from renewable plastic. The search for a reliable injection moulding process for biodegradable 'liquid wood' was undertaken in close cooperation with Sumitomo (SHI) Demag Plastics Machinery GmbH, of Schwaig, Germany.

During an intercompany meeting Herbert Perschl, Managing Associate and Founder of Alento AG presented a collection of his urns. "We developed an injection-moulded product from a wood material that we were able to market almost immediately. This is because undertakers are increasingly looking for urns made of environmentally friendly materials."

Formulations for different material properties

Perschl spread some Arboform granulate across the conference table. "Because we make urns made of liquid wood with many different material properties and produced from different mixtures of raw materials, we are able to control the decomposition process. As an example we can point to cremation urns for burial at sea, which we can design in such a way that they disintegrate in the water within three days."

The urns, which Alento sells throughout Europe, are currently available with a capacity of 4.5 litres. Compared with the usual urns made of natural materials, the Alento urn is dimensionally more stable and has a more attractive surface. In addition, it offers a patented, ash-proof lock mechanism based on a special sealing contour between lid and container and which does not use glue. If required, the company supplies a lid that makes it impossible to open a sealed Alento urn without destroying it.

At present Alento produces around 5,000 urns made from Arboform each year and the trend is rising sharply. Manfred Zoss, who is responsible for sales and financial management, drew attention to the texture of an urn. "Each urn is unique. We have achieved even more variety since we also succeeded in making white and reddish-brown urns." In addition to a wide range of colours, there is a choice between smooth surfaces and surfaces with patterns or engravings. Herbert Perschl demonstrated by knocking on the material and trying to bend the edges. "Depending on the composition of the material, it may be more flexible, more robust or firmer and have a very high elongation at its breaking point."

By

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Urs Kocher from MAPAG Maschinen AG, the Swiss representatives of Sumitomo (SHI) Demag, with (l to r) Herbert Perschl and Manfred Zoss, of Alento AG, expect an attractive market for products made from the biomaterial Arboform (Photo: Sumitomo (SHI) Demag)

Perishability is the decisive criterion

The thermoplastic material Arboform can also be used beneath fine wood veneers in cars as it meets the strict thermal requirements with regard to the maximum temperature variations in such applications.

The material is mainly produced from the lignin and cellulose wood components and therefore from fully renewable raw materials. The developer and producer of Arboform, Tecnaro GmbH of Ilsfeld, Germany, adds further natural fibres and natural additives to the lignin powders, in addition to cellulose. The mixture is then compressed into a pea-sized granulate.

Arboform, tougher than wood and mouldable into almost any shape, is practically an invitation to developers to think up some new application ideas. Herbert Perschl took a shoe-tree out of the cupboard. "This complex product ensures that a shoe retains its shape. At the same time it discharges moisture." As the material is obtained from renewable sources, it is completely free of pollutants, bio-degradable, compostable and recyclable. For Alento this perishability is a decisive criterion. On decomposition and incineration the material only releases the volumes of CO_2 that the plants in question absorbed from the atmosphere when they were growing. Thanks to its highly constant quality, based on the lignin in its matrix, Arboform also has an advantage over other thermoplastics made of renewable raw materials.

Close cooperation with Sumitomo (SHI) Demag

When looking for a reliable injection moulding process for Arboform, Herbert Perschl contacted Sumitomo (SHI), especially as he has been very satisfied with machines from this manufacturer for the last 13 years. "We acquired our know-how in three years of close cooperation with Demag's specialist departments and developed it into our core competence." Even today both companies still meet together to form teams when it comes to modifying or optimising the process for specific applications.

Arboform is injected into a mould at a pressure of 1,000 bar and a temperature of between 110 and 170°C. Because the material needs moisture in order to plasticise, which distinguishes it from other natural-fibre injection mould granulates, it does not need to be dried before processing, despite its hydrophilic character. Apart from this, the process uses approximately 30 % less energy than is needed by conventional plastics, as the temperature profile of the liquid wood is significantly lower.

During a walkabout Perschl stopped in front of a machine made by Sumitomo (SHI) Demag. "The main challenge was to be able to process natural fibres with standard injection moulding machines. The cooperation with Demag was outstanding and Demag designed a universal machine for all available materials on the market." The injection profile, for example, has been adjusted by modifications to the speed and the pressure. The temperature profile has also been adapted and the ventilation improved. In addition, the characteristics specific to the material have been identified and have been taken into account when manufacturing the tools, as well as considering how the process is to be adapted to the proportion of fibres and the product being moulded. It is also vital to treat the material with care during melting in the plasticising cylinder of the injection moulding machine. A worm geometry suitable for the requirements ensures a constant melt quality. "While the reject rate was at 80 % at the beginning of the project, it has now fallen to below 1 % and the development is by no means over," Perschl continued.

www.alento.ch
www.sumitomo-shi-demag.eu

Alento developed the reliable injection moulding process for Arboform in three years, in close cooperation with Sumitomo (SHI) Demag. (Photo: Alento AG)