

Simply plastics...

NatureWorks says its resins and fibres are now meeting all demands in respect of price, performance and preference. **Adrian Wilson** reports.

A significant number of major fibre suppliers to the global nonwovens industry were present at the Innovation Takes Root conference held by NatureWorks in Orlando, Florida, from February 17-19.

This underlines a current escalation in the adoption of Ingeo PLA fibre by the industry, following the introduction of a number of tailored new grades during 2013, along with high profile launches such as Fitesa's new PLA/BioPE bicomponent materials.

NatureWorks CEO Marc Verbruggen said that the company's Blair plant in Nebraska was operating at an annual 150,000 tons and that Ingeo resin grades now satisfy requirements for many applications in respect of what the company calls the 'three P's' – performance, price and preference.

"The goal now is that bioplastics will come to be seen as simply plastics," he said. "It will become expected that they are bio-based, but performance will be king, and they will be biodegradable only where this is to the highest good."

Feedstock options

At the same time, NatureWorks is also accelerating its feedstock options as it moves towards establishing its second plant in Thailand, and with an eye to the longer-term potential of directly exploiting waste methane as a source for its lactic acid, via its partnership with biochemicals specialist Calysta, also announced in 2013.

"NatureWorks is in the business of turning greenhouse gases into performance products and we are



committed to feedstock diversification,” Verbuggen said. “Our performance materials will be made by transforming whatever are the right, abundant, local resources.”

Lighter than spunbond

Kimberly-Clark has developed a range of engineered Ingeo PLA composites with unique nanocellular structures for spunbond nonwovens.

Senior engineer Ray McEneaney said K-C had worked on the development of PLA for 15 years and it plans to promote the new materials outside its own markets in a partnership with venture capital firm Irrigo.

Ingeo PLA has already been used in the company's products – as a spunlace liner in Huggies Gold Naturemade diapers, and as a bicomponent liner with PP in Huggies Pure & Natural products.

The new multi-component materials, however, have a range of potential new applications. They are said to have the same toughness as those based on

polypropylene, but with a higher stiffness, while their impact strength is the equivalent to impact-modified polypropylene webs. At the same time, their strength and stiffness is on par with PET materials, again with improved stiffness.

They are affordable and easy to produce.

The nanocellular structures are composed of a combination of micro and nano voids and closed cellular structures which can be tuned to deliver targeted properties and pore sizes.

Uniform structures can be created which are repeatable at multiple scale and the high void content can be above 50%.

In spunbonds, they increase the MD (machine direction) tensile strength by 57% compared to PLA with over five times the MD elongation.

A controlled drawing process is responsible for the significant weight reduction in the fibres, resulting in new PLA materials that are:

- Lighter than polypropylene.
- Have the modulus of polyethylene.

- Can provide a new level of impact strength in polyesters.
- These developments are covered by a range of patents as part of K-C's active portfolio of over 600.

A century in silver

For most of the 20th Century Kodak held a dominant position in photographic film – back in 1976 it had an 89% market share of US photographic film sales.

The company began to struggle financially in the late 90s as a result of the decline in sales of film and also its slowness in shifting to digital – despite having invented the core technology used in current digital cameras.

In January 2012, Kodak filed for Chapter 11 bankruptcy, emerging again in September 2013.

At that point the company decided to take a closer look at what else could be done – not least with the approximately 10,000 patents backing up a century's expertise in silver chemistry.





Silver as an antimicrobial active ingredient was an obvious area, and among initiatives here, Tom McHugh, the company's director of materials technology explained that Kodak has recently forged a two-way exclusivity agreement for the supply and development of anti-microbial filaments and textiles with PurThread Technologies

PurThread's process embeds Kodak's antimicrobial agent into synthetic fibres before they are spun, ensuring the antimicrobial effects of the fabric are uniform and constant throughout the life of the product. Spunbond PET fabrics are produced with sheath/core bicomponents containing silver.

"The antimicrobial technology sector is an exciting new venture for Kodak," said McHugh. "Because of PurThread's unique manufacturing process and expertise in the textile industry, we are delighted to be working with them to bring to market products using our propriety materials and technology."

A double-blind randomised controlled trial published in December found that PurThread privacy curtains resisted contamination seven times longer than control curtains – which were also eight times more likely to be contaminated with the superbug VRE. This study, conducted by the University of Iowa, is the only randomised controlled trial to examine the role of antimicrobial privacy curtains.

Bicomponents

Benham Pourdeyhimi, executive director of the North Carolina-based Nonwovens Institute provided details of a number of new bicomponent fibres that have been developed with unique cross sections.

These include core-modified trilobal microfibres, where both the core and the tips are exposed on the surface for more efficient processing.

PLA is also being employed as an effective sacrificial fibre in 'islands in the sea' constructions, via which nanofibres can be produced through splitting and bonding by hydroentanglement.

The Nonwovens Institute has been called 'the best kept secret in the USA', involving some 65 companies that have ensured North Carolina's nonwovens industry, is bigger, for example, than the US biotech sector.

Among applications currently being pursued at the Institute are liquid filtration filter media that can get closer to membranes in performance, as well as high absorbency and high loft materials for thermal and sound insulation that are almost as light as foam.

Meltblown against HAIs

Kerem Durdag, CEO of Biovation, based in Boothbay, Maine, outlined the value-added possibilities of Ingeo PLA meltblown nonwovens, specifically incorporating silver in glass zeolite particles, which are highly effective at preventing the spread of hospital acquired infections (HAIs).

These next generation of Biovation PLA-based products for healthcare, he said, will be at least 95% bio-based and designed specifically for a multiplicity of applications, while being cost effective due to the high throughput achieved in their production.

At the same time, they will be capable of 99.9999% effective antimicrobial action and it will be possible to finely-tune the speed and duration of the release of the antimicrobials.

One product that has been advanced already is a disposable cover for a blood pressure cuff that could prove particularly useful.

3D printing

There's a wealth of know-how in fibres and yarns for technical textiles behind

Applied Polymer Innovations BV (API), based in Emmen, the Netherlands.

This company comprises around 20 of the key specialists who have previously worked at now-vanished major European producers including Enka, Akzo Nobel, Acordis and Diolen. Today, it is largely involved in R&D and lab and pilot-scale activities.

Established in 2008, API has so far focused on the development of high-end applications employing biopolymers and the niche production of mono and multifilament yarns, such as those for tyre cord.

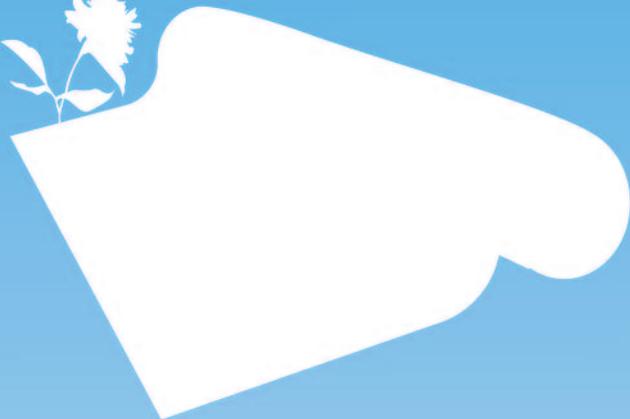
One market, however, has come entirely out of the blue and is now taking on epic proportions for API – the sudden adoption of PLA as the polymer and monofilament of choice for 3D printing.

API's Bas Krins said that the company has rapidly become the largest manufacturer of PLA monofilaments for 3D printing and has been entirely sold out throughout 2013.

It has consequently employed a toll manufacturer capable of meeting demand – working around the clock – as it rushes to put in place the equipment necessary to deliver five times its currently-achievable volume this year.

The European market for PLA as a 3D printing feedstock is as yet small – an estimated 700 tons or so – but its rise has been rapid and surprising – as much to NatureWorks as the PLA supplier as anyone else.

API produces the monofilaments for this end-use in a range of sizes and types such as flame retardant and thermochromic versions. In addition, to forming the printed structures, it's also being used in a water-soluble form as a support structure. **SNW**



naturally advanced materials

Come see the latest performance Ingeo resins and commercial applications in fibers and nonwovens that offer renewable and sustainable solutions. Also, meet our team of experts and have your Ingeo questions answered.

Don't miss NatureWorks' Robert Green present *PLA Fibres: Supporting Specialty Nonwovens in Packaging*

Packaging Workshop: Nonwovens in Packaging
Wednesday, April 9th
Room T, Hall 1
10:10-10:35am Stand 1510



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