



Healthy horizons. A sugar beet field in western Europe. Sugar beet pulp contains pectins that can act as bio-based ingredients for leather chemicals.

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RENEWABLE



WASTE-FREE



SUSTAINABLE



RECYCLED



GREEN JOBS

Circular economy horizons

Platform leader for bio-based chemicals at leather chemicals manufacturer Smit & Zoon, Dr Yujie Ma, says leather should be one of the first names on anyone's list of circular economy products, but she says there is no time for companies in the leather value chain to stand back and congratulate themselves on this. Instead, she insists work to make leather "more circular" must continue. A whole bio-based economy is developing quickly, especially in the Netherlands, where Dr Ma (originally from China) is now based, and it seems to her that the whole of society is "switching", looking for products that are, for example, biodegradable or compostable.

Leather chemicals manufacturing might be too many steps upstream in the supply chain to register directly with consumers, but part of her work at Smit & Zoon is to enable this switch by searching for new bio-based solutions that will deliver the same or even more benefits to tanners as traditional products have done.

Step by step

Using what she calls "renewable content", raw materials that derive from biomass rather than from fossil fuels, is an idea that the Dutch leather chemicals manufacturer introduced in 2017 when it launched its 'Product Passport' for wet-end chemicals. It took this step to offer customers greater transparency into the contents of the leather

Leather meets many of the criteria that circular economy products must fulfil. Smit & Zoon's platform leader for bio-based chemicals, Dr Yujie Ma, argues that, to make leather even more circular, hard work and effective communications must intensify in the 2020s.

chemicals they were buying to help them communicate better with end-users and, especially, to manage tannery wastewater treatment in a more informed, science-based way and thus contribute to improving the leather industry's environmental footprint.

"Step by step," the platform leader for bio-based chemicals says, "we want to increase the renewable content of all our existing product groups." She describes improving the renewability of existing syntan and fatliquor products as "horizon one". Studies have shown this part of the portfolio to be the area in which renewable raw materials can make the



fastest impact. Horizon two will be to develop completely new products that, ideally from top to bottom, follow the circular economy concept.

Wooden heart

Lignin-modified polyphenolic leather chemicals are an example of horizon-one products that the company has already been working on. Lignin is a natural cross-linked polyphenol derived from biomass that is formed in the cell walls of wood or agricultural crops and plants. It constitutes about 20-35% of the mass of every tree or plant and is the most abundant natural aromatic resource. As a by-product of the pulp and paper industry, lignin is usually burned to generate energy. Smit & Zoon now has a worldwide patent application for using industrial lignin together with phenol in the production of polyphenolic retanning chemicals that have traditionally been 100% petrol-based. Dr Ma and her colleagues have found that lignin-based products can work well in leather production, bringing fullness and softness to finished leather and intense colour after dyeing.

Inherited project

In terms of horizon two, she points to the Life Biopol project as one example that has already made an impact in tanneries. This is a project, co-financed by the European Commission, that brought together five partners: Smit & Zoon's Italy-based division Codyeco, an academic team from Università Ca'Foscari in Venice, biotechnology company ILSA and two tanners from Spain, Dercosa and Inpelsa. Its aim is to drive the development of processes for producing new biopolymers for use in the tanning industry, and to demonstrate the technical performance, economic viability and improved environmental impact of the new products that emerge.

Dr Ma says Life Biopol has given Smit & Zoon a head-start on horizon two. "Life Biopol began in 2016, which is also when we set up these horizons," she explains. "Our acquisition of Codyeco happened at the end of 2017. By then, Codyeco was already working on Life Biopol and, as soon as Codyeco became a subsidiary, it was clear that this idea was perfect for horizon two because it's about making new products."

Expected results

Starting from an idea originated at Codyeco about four years ago, Life Biopol is reaching its conclusion now and the results it has produced are impressive, according to data from Life Cycle Assessments (LCA). Benefits include an increase in the reuse of biomass side-streams and reductions of hazardous substances compared to those traditionally found in leather chemicals.

In wastewater treatment plants, tanners using Life Biopol biopolymer-based leather chemicals may also expect reductions of up to 98% in sulfates, up to 15% in chloride salts, 57% in total nitrogen and a 100% reduction in chromium III salts in certain retanning processes. They can also look forward to a 25% reduction in water use. The project partners have gone as far as to say that the overall product environmental footprint of the new biopolymers can be up to 77% lower than that of the retanning chemicals leather manufacturers have had available to them until now.

In addition to the above environmental advantages, the new biopolymers have been shown to deliver leather

articles with similar properties to those made from traditional leather chemicals. Codyeco and Smit & Zoon are preparing to bring to the wider market the products that have emerged from Life Biopol, aiming for a launch this year for the first of these.

Good food waste

A more recent project to have come to light is also "very clearly horizon two" in the eyes of Dr Ma, although the resulting products will probably still take a number of years, perhaps as many as five, to become available on a broad industrial scale. In December, Smit & Zoon announced the successful conclusion of a research project that focused on using beet pulp extracts as part of the raw materials for some of the products in its wet-end chemicals range.

Working with two partners in the Netherlands, a specialist food and bio-based research centre based at Wageningen University, and Cosun, a processor of beet pulp, Smit & Zoon has found that pectins from sugar beet pulp are suitable as bio-based ingredients in the production of leather. These pectins serve as substitutes for non-biodegradable polymers in chemicals for the wet-end production process. They can also influence the characteristics of finished leather, for example, its colour intensity.

Beyond horizon two

Asked what is beyond horizon two, Dr Ma says: "The clear direction for us is horizon three, although people have different ideas about what that will be. I think that it must be about making the entire leather value chain more circular. The focus for Smit & Zoon has always been the wet end, but we want to extend this to the whole value chain. First, we can build up the biodegradability of our chemicals and of finished leather and build a holistic view of the whole process from there."

She explains that the company's aim is to be "future-proof" in serving a changing leather industry. "Smit & Zoon is a family business," she says, "and we want that to continue, with the next generations coming into the company. Hence we are intrinsically motivated and committed to reach for a higher sustainability standard." This will require the leather industry to withstand the storms it faces, which this particular circular economy thought leader believes it will do more effectively if it emphasises the role it already plays in turning waste into value, detritus into desirable products.

"The industry needs to keep coming up with new ways of doing this," she concludes, "further improving the image the material has and building a whole circular concept. This goes beyond tanners and finished leather product manufacturers making money. It will give consumers good reasons to love leather and to keep using it. It will also give the people who work in the industry reasons to stay and reasons to be proud of what they do." 🌱



Dr Yujie Ma, platform leader for bio-based chemicals at Smit & Zoon. CREDIT: SMIT & ZOON